Volume 14 July, 1959 No. 3

JOURNAL of GERONTOLOGY

RECEIVED
AUG 3 1 1959
WEST VIRGINIA UNIVERSITY
MEDICAL CENTER LIBRARY

Section A

PAGE

Reality of Age Differences in Nervous Tissue ... *W. Andrew* 259

Aging Heart. 1. Endocardium ... *J. B. McMillan and M. Lev* 268

Effects of Age and of Krebs-Cycle Metabolites on the Inhibition of Mouse Brain Respiration by Pentobarbital ... *M. Desbarats-Schonbaum and M. K. Birmingham* 284

5-Nucleotidase Activity of Human Arterial Tissue in Individuals of Various Ages ... *J. E. Kirk* 288

Study of Serum Alkaline Phosphatase Levels in Old People Living at Home ... *W. Hobson and A. Jordan* 292

Oral Complaints and Taste Perception in the Aged ... *T. Cohen and L. Gitman* 294

Outline of Gerontology in Japan and Some Aspects of Life Span and Causes of Death in the Japanese ... *S. Watanabe* 299

Cornell Medical Index Questionnaire as Measure of Health in Socio-medical Research ... *C. Gordon, A. R. Emerson, and J. Simpson* 305

Geriatric Practice: Heart Diseases in Old Age. 2. Treatment ... *T. Geill* 309

Section B

Critical Flicker Frequency and Some Intellectual Functions in Old Age ... *A. W. Loranger and H. Misiak* 323

Consumer Patterns of Aged Spending Units ... *S. Goldstein* 328

Is Age Kinder to the Initially More Able? ... *W. A. Owens* 334

Informal Groups and Institutional Adjustment in a Catholic Home for the Aging ... *M. A. Amen* 338

Air Ionization, Age, and Maze Learning of Rats ... *J. Jordan and B. Sokoloff* 344

Changing Costs in the Public Care of the Aged ... *L. Saville* 349

A Sentence Completion Procedure for Assessing Attitudes Toward Old People ... *P. J. Golde and N. Kogan* 355

Section C

Organization Section ... 366

Index to Current Periodical Literature ... *N. W. Shock* 371

Published Quarterly by
THE GERONTOLOGICAL SOCIETY, INC.

EDITORIAL STAFF
GERONTOLOGICAL SOCIETY, INC.

EDITORIAL BOARD

ALBERT I. LANSING, *Chairman*
Pittsburgh

ARTHUR A. HELLBAUM
New York

ROBERT W. KLEEMEIER
St. Louis

ERNEST W. BURGESS
Chicago

EDITORS, JOURNAL OF GERONTOLOGY

JOHN ESBEN KIRK, *Editor-in-Chief*
ROBERT J. HAVIGHURST, *Associate Editor, Section B*
BERNICE L. NEUGARTEN, *Associate Editor, Section B*
NATHAN W. SHOCK, *Assistant Editor*
JAMES E. BIRREN, *Assistant Editor*
MARJORIE ADLER, *Assistant to the Editor*

FOREIGN CORRESPONDENTS

Correspondent for Argentina
B. A. HOUSSAY, Buenos Aires
Correspondent for Austria
W. DOBERAUER, Vienna
Correspondent for Canada
R. I. MACDONALD, Toronto
Correspondent for Denmark
T. GEILL, Copenhagen
Correspondent for Finland
E. JALAVISTO, Helsinki
Correspondent for France
F. BOURLIÈRE, Paris
Correspondent for the Grand Duchy of Luxembourg
R. SCHAUS, Luxembourg
Correspondent for Great Britain
V. KORENCHEVSKY, London
Correspondent for Ireland
J. F. FLEETWOOD, Dublin
Correspondent for Italy
G. MARS, Milan
Correspondent for Mexico
E. AGUIRRE PEQUEÑO, Monterrey
Correspondent for the Netherlands
R. J. VAN ZONNEVELD
Correspondent for South Australia
O. W. FREWIN, Adelaide
Correspondent for Sweden
E. ECKERSTRÖM, Gothenburg
Correspondent for Uruguay
J. M. SOSA, Montevideo

EDITOR, NEWSLETTER

OSCAR J. KAPLAN, *San Diego, California*

ADVISORY EDITORIAL BOARD

BERT G. ANDERSON, Dentistry
Yale University

DAVID P. BARR, Internal Medicine
Cornell University

WALTER M. BEATTIE, JR., Social Welfare
Lindenwood College

E. M. BLUESTONE, Hospital Administration
Montefiore Hospital

D. E. CAMERON, Psychiatry
McGill University

MARGARET CHIEFFI, Internal Medicine
St. Louis, Missouri

ABRAHAM DURY, Biochemistry
Dorn Laboratory for Medical Research

W. H. FELDMAN, Veterinary Medicine
Mayo Foundation

A. C. FURSTENBERG, Otolaryngology
University of Michigan

WILLIAM M. GAFAFER, Biostatistics
United States Public Health Service

E. C. HAMBLEN, Endocrinology
Duke University

FRANK HINMAN, Urology
University of California

FREDERICK L. HISAW, Zoology
Harvard University

OSCAR J. KAPLAN, Psychology
San Diego State College

FORREST E. LINDER, Statistics
Bureau of the Census

IRVING LORGE, Psychology
Teachers College, Columbia University

C. M. MCCAY, Nutrition
Cornell University

WILLIAM MUHLBERG, Insurance Medicine
Union Central Life Insurance Co.

WINFRED OVERHHOLSER, Psychiatry
St. Elizabeth Hospital

OLLIE RANDALL, Social Welfare
Community Service Society of New York

PEYTON ROUS, Oncology
Rockefeller Institute for Medical Research

HENRY SIMMS, Biochemistry
Columbia University

OWEN H. WANGENSTEIN, Surgery
University of Minnesota

ARNOLD WELCH, Pharmacology
Western Reserve University

PAUL D. WHITE, Cardiology
Massachusetts General Hospital

W. R. WILLIAMSON, Actuarial Science
Wyatt Company, Washington, D. C.

PROGRAM

Twelfth Annual Scientific Meeting of the Gerontological Society, Inc.

(Details will be published in the October issue)

Hotel Statler, Detroit, Michigan

November 12, 13, 14, 1959

Thursday, November 12

8:00-10:00	Registration
10:00-11:30	General Session
11:30- 1:30	Luncheon Intermission
1:30- 3:00	Papers, Five Concurrent Sessions
3:00- 3:30	Coffee Break and Viewing Exhibits
3:30- 5:00	Papers, Five Concurrent Sessions
6:00- 6:45	Reception and Social Hour—Courtesy Parke Davis Company
6:45- 9:00	Dinner, Addresses, Gerontological Research Foundation Awards

Friday, November 13

8:00- 9:00	Business Meetings of each of the Five Sections of the Society
9:00-10:30	General Session
10:30-11:30	Papers, Five Concurrent Sessions
11:30- 1:30	Luncheon Intermission
2:00- 5:00	Papers, Five Concurrent Sessions
7:45- 9:00	Public Meeting

Saturday, November 14

9:00-11:30	Papers, Five Concurrent Sessions
12:00- 2:00	Conference Luncheon, Business Meeting, and Summary of 1959 Meeting

ADVANCE REGISTRATION

Twelfth Annual Meeting—Gerontological Society, Inc.

Detroit, Mich., November 12, 13 and 14, 1959

Return to: Dr. A. Hazen Price
62 West Kirby Avenue
Detroit, Michigan

Name ..... (please print)

Address ..... (please print)
(Street) (City and Zone) (State)

Check if you plan to attend:

Thursday, November 12

Reception and Social Hour ..... ☐ Guests (No.) .....

Banquet ..... ☐ Guests (No.) .....

Saturday, November 14

Luncheon ..... ☐ Guests (No.) .....

HOTEL RESERVATION

	Single	Double	Twin
Statler Hilton Hotel Grand Circus Park at Washington Blvd. Detroit 31, Mich.	$7.50-$14.00	$13.00-$17.50	$13.50-$29.00

Please reserve the following accommodations (confirmation will be made by hotel):

..... Single Room Desired Rate ..... Maximum Rate .....

..... Double Room Desired Rate ..... Maximum Rate .....

..... Room with Twin Beds Desired Rate ..... Maximum Rate .....

Date and time of arrival ..... Date and time of departure .....

Name ..... (please print)

Address .....

JOURNAL OF GERONTOLOGY

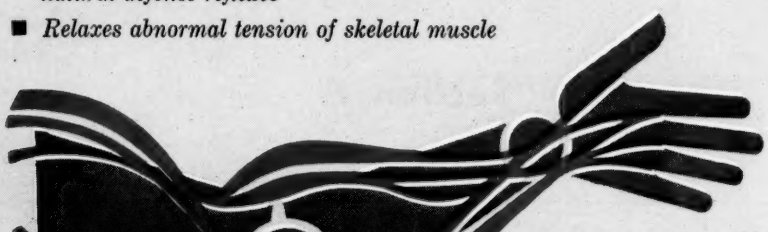
VOLUME 14, NUMBER 3
JULY, 1959

Section A

Biological Sciences and Clinical Medicine

now... a new way to relieve pain and stiffness in muscles and joints

- *Exhibits unusual analgesic properties, different from those of any other drug*
- *Specific and superior for relief of* SOMAtic *pain*
- *Modifies central perception of pain without abolishing natural defense reflexes*
- *Relaxes abnormal tension of skeletal muscle*



SOMA™

N-isopropyl-2-methyl-2-propyl-1, 3-propanediol dicarbamate

In back pain, bursitis, sprains, strains, and bruises, whiplash and other traumatic injuries, inflammatory and degenerative muscle and joint complaints.

RAPID ACTING. Pain-relieving and relaxant effects start within 30 minutes and last for at least 6 hours.

NOTABLY SAFE. Toxicity is extremely low. No effects on liver, endocrine system, blood pressure, blood picture or urine have been reported. Some patients may become sleepy on higher than recommended dosage.

EASY TO USE. Usual adult dose is one 350 mg. tablet 3 times daily and at bedtime.

SUPPLIED: Bottles of 50 white sugar-coated 350 mg. tablets.

Literature and samples on request.

WALLACE LABORATORIES, NEW BRUNSWICK, N. J.

JOURNAL OF GERONTOLOGY

VOLUME 14, SECTION A JULY, 1959 NUMBER 3

THE REALITY OF AGE DIFFERENCES IN NERVOUS TISSUE*

W. ANDREW, M.D., Ph.D.†

(From the Department of Anatomy, Bowman Gray School of Medicine, Winston-Salem, North Carolina)

The choice of the nervous system and particularly the neurons for investigation on cellular age changes is motivated by the fact that the nerve cells, because they do not reproduce after fetal or very early postnatal life, have a life span practically equal to that of the organism; such long-lived cells may therefore be expected to show age changes.

Our earlier investigations on the brain of the mouse (1, 2, 4, 5) and on the human brain (3, 7) resulted in findings which were in agreement with those of the majority of other workers on a variety of animals: dog (8, 10), rat (13), guinea pig (15), ape (11), and man (11, 12, 14). These observations have been reviewed recently by the present author (6) and will not be described in detail here. We may emphasize, however, that many positive findings have been reported. While different groups of nerve cells show different degrees and even types of alteration, certain general changes, such as diminution of Nissl material or decrease in the intensity of its basophilia, loss of clarity of the nucleus, and degenerative alterations leading to loss of cells, are very widespread.

As new methods are developed in any field, it often becomes desirable to re-examine that field and the results obtained by workers who could not have employed these methods. At a conference on Aging of the Nervous System sponsored by the National Institute of Neurological Diseases and Blindness at Bethesda, a review was made of some of the earlier work in the field, and reports of several very recent investigations were made. The two most prominent features of these recent studies were 1) methods of fixation different from the "classical" immersion one were used and 2) the results in relation to age differences were largely or entirely negative.

These reports naturally lead to the question as to whether, in some way, the age differences described earlier have been brought about by the very process of preparation. It would seem that, even if the differences in the histological picture were thus brought about, some underlying difference of the nervous tissues of young and old animals in their reaction to the fixation process would have had to be present in the *fresh* tissue. Indeed, Gellerstedt (9), who studied an extensive series of human brains and described the presence of age differences, was inclined to ascribe the hypochromatism seen in large numbers of nerve cells in the senile brain to the occurrence of "preagonal changes" in the old brains due to a greater "vulnerability of their cells."

The points of view expressed at the Bethesda conference make necessary some re-examination of the age differences in the nervous system. It raises at least two important questions: 1) could the differences earlier described on material fixed by immersion have been due to some difference in "susceptibility" of cells at different ages and not to differences existing in living or in fresh tissue? and 2) if not, could most or all of these differences have been the result of errors of subjective interpretation by the investigators, due perhaps to an expectation and even a desire to see differences? The second possibility would be understandable perhaps on the basis of the subtle nature of some of the differences described in populations of cells.

The present study was undertaken to investigate these problems. For this purpose we have studied nervous tissue of young and of senile

Submitted for publication August 14, 1958.

* Supported by a grant from the Josiah Macy, Jr. Foundation.

We are much indebted for aid in the making of the preparations to Dr. C. E. McCreight, Mr. J. B. Taylor, and Mr. W. S. Belmont. The absorption studies on stained sections were performed by Dr. J. E. Kirk.

† Present address: Department of Anatomy, Indiana University Medical Center, Indianapolis 7, Indiana.

TABLE 1. ANIMALS AND METHOD OF FIXATION.

Perfusion (Age in Days)	Immersion	
	Method A (Age in Days)	Method B (Age in Days)
83	37	128
179	59	129
208	169	129
209	192	130
608	629	134
613	659	497
622	...	555
668	...	590
809	...	596
...	...	597

animals, fixed by *perfusion* and we have re-examined the question of age differences seen in tissues fixed by immersion.

MATERIAL AND METHODS

The brains of 25 C57 Black mice have been studied. Three methods of preparation were used. The first involved fixation by perfusion, the second and third fixation by immersion.

The perfusion was carried out on 9 animals according to the directions of Windle (17). The ages of the mice included in the study are listed in table 1. After lightly anesthetizing the animal with ether, the thorax was opened, and a fine hypodermic needle (B-D Yale-lok 22G-1 1/4) was inserted into the left ventricle. Moderate pressure was used and the solutions flowed freely. The vascular system was then flushed with Solution A, approximately 10 cc. being used. The actual perfusion was then carried out with the same amount of Solution B. The inferior vena cava was opened to allow drainage of blood at the time of starting the flushing.

The cranial case was then opened, the brain was removed entire and stored in 10% formalin.

The compositions of Solutions A and B are as follows:

Solution A (for flushing)

NaCl	9.0 Gm.
Gum acacia	24.0 Gm.
Formalin	2.0 cc.
Distilled water	To make 1.0 L.

Solution B (for perfusion)

NaCl	9.0 Gm.
Gum acacia	24.0 Gm.
Formalin	100.0 cc.
Distilled water	To make 1.0 L.

Before dehydration the specimens were washed for two hours in running water. They were then passed through 30, 50, 70, 80, and 95% alcohol and two changes of absolute alcohol, remaining one hour in each solution. Two changes of xylol, each of 10 minutes' duration, followed, then two baths of warm paraffin of two hours each, and finally a third bath of overnight duration. The brains were embedded in histowax and sectioned at 10 μ.

For the staining procedure the sections were deparaffinized, hydrated, and stained for two min. in a 1% aqueous solution of cresyl violet. They were then washed in two changes of distilled water. Differentiation was begun in 95% alcohol, two min., continued for two min. in absolute alcohol, and completed in absolute alcohol to which had been added a trace of 10% colophonium in absolute alcohol (20 drops per 250 cc.). The final differentiation required 30 min. Clearing was carried out in 4 changes of xylol, 5 min. each, and the sections were mounted in Permount.

Six mice were used for preparation of the brains by ordinary immersion fixation with the other technical procedures exactly as for the perfused animals (immersion, method A, in table 1).

In addition to the mice thus used, nervous tissue from 10 other mice was prepared by immersion fixation and a somewhat different procedure in the other technical steps (immersion, method B, table 1). For the brains of these animals, fixation was in 10% formalin, where the tissue remained for from two hours to several days. They were then carried through 70, 80, 95, and 100% alcohol, remaining for periods of one-half to one hour in each. There followed alcohol-chloroform, one part chloroform with two of alcohol, then equal mixtures of alcohol and chloroform, then three parts chloroform to one of chloroform, and finally pure chloroform. The tissues remained in each of the fluids for from one hour to overnight. They were then placed in warm paraffin until the chloroform was removed, as determined by loss of odor, a time which was at most one hour. They were embedded in paraffin and sectioned, as were the tissues previously described. For staining, deparaffinization was carried out in xylol. After hydration, the sections were stained in 1% aqueous solution of cresyl violet for two min., washed in distilled water, differentiated as above in 95 and then 100% alcohol with final differentiation in absolute alcohol with colophonium as above, cleared, and mounted. Immersion fixation, method B, was

Fig. 1. *A*. Sagittal section of the brain of a 590-day-old C57 Black mouse. Immersion fixation, method B. X6.5. *B*. Sagittal sections of the brain of a 129-day-old C57 Black mouse. (A and B stained synchronously on same slide). Immersion fixation, method B. X6.5.

Fig. 2. *A*. Cells of the nucleus of the facial nerve of a 209-day-old C57 Black mouse. Perfusion fixation. X1352.

Fig. 2. *B*. Cells of the nucleus of the facial nerve of an 809-day-old C57 Black mouse. Nuclear and cytoplasmic age differences are seen. Perfusion fixation. X1352.

used for comparison with the perfusion fixation and with immersion fixation, method A, because method B had been employed in preparing nervous tissue from a large number of specimens on which counts of binucleate cells were planned.

It is not easy to judge the relative value of one technical procedure as compared to another. Of the two methods of preparation employed for our material fixed by immersion, the one in which xylol rather than chloroform was employed in clearing before infiltration (method A) seemed somewhat preferable, as judged by a lesser amount of shrinkage of cell bodies and a smaller number of vacuoles in the interstitial material. The perfused material gave an appearance of very good fixation in all instances, if lack of pericellular spaces and of extracellular vacuoles are good criteria, and seemed somewhat superior to its counterpart, immersion, method A.

RESULTS

Two types of comparison of the brains of animals of different ages were made. In a gross comparison of the tissue samples a diffusely deeper stain of the brains of younger animals was observed. This was first noted on sections which had been mounted on separate slides but carried through the deparaffinization, hydration, staining, dehydration, and clearing processes together. It was confirmed by mounting sections of the brains of young and old animals on the same slides, in alternate rows. Figure 1 shows the magnitude of the age difference seen in material fixed by immersion, method B. The material fixed by perfusion showed a difference of lesser degree but similar type.

A study of the material for the light absorption characteristics of the standard sections, using a Beckman spectrophotometer, revealed a definite difference between the sections from the young and old mice. The absorption curve of the cresyl violet solution used in staining was of interest in showing a maximum located between the maxima for the stained tissue slides from the young and old animals.

The second type of comparison is that of the individual cells in the various regions of the brain. Since these have been described at length previously for immersion-fixed material and recently reviewed (6), we may concentrate our description on the material fixed by perfusion. It is particularly on such material that

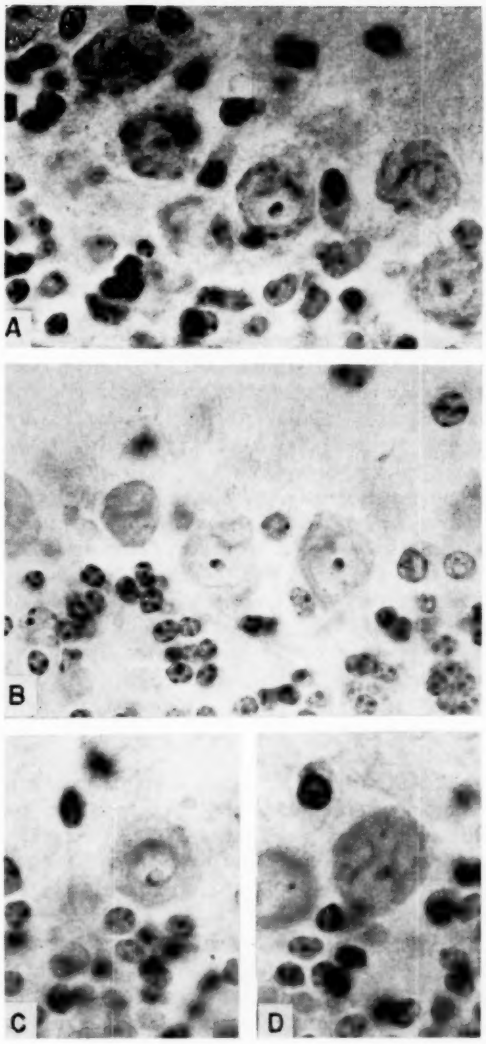


Fig. 3. *A*. Purkinje cells of the cerebellum of a 209-day-old C57 Black mouse. Nissl material is fairly abundant. *B*. Purkinje cells of the cerebellum of an 809-day-old C57 Black mouse. Nissl material is scanty. *C*. Eccentric nucleolus in Purkinje cell of an 809-day-old mouse. *D*. Aberrant form of nucleus in Purkinje cell of an 809-day-old mouse.

All cells in Figure 3 are from sections of brain fixed by perfusion and mounted and stained on the same slide. Cresyl violet. X1352.

negative results in relation to age change have been reported (16).

In our own perfusion-fixed material there seems to be a minimum of possible artifactual change, such as shrinkage or formation of extracellular or intracellular vacuoles. For the comparison of cell types in young and old animals we chose the Purkinje cells, the large motor cells of the nucleus of the facial nerve, and the cells of the dentate nucleus of the cerebellum.

The majority of Purkinje cells in the perfused brains from young animals show a content of abundant, discrete, and deeply stained granules of Nissl material. In such cells the nuclei generally are clear, sometimes sharply so, and the chromatin in relation to the nucleolus is very deeply stained (fig. 3-A). There always are some cells present in which, in contrast, the cytoplasm is deeply and almost homogeneously stained and in which the nuclei are obscured. Such cells are the so-called "chromophilic" cells.

In the perfused cerebella of the old animals the Purkinje cells show generally a rather lightly staining cytoplasm with few Nissl granules and those which are visible are more weakly staining (fig. 3-B). Chromophilic cells are present here also but do not stain as intensely as in the younger mice.

The Purkinje cells of senile animals show a number of aberrations of the nucleus. Among the more common of these are an eccentric position of the nucleolus (fig. 3-C) and a lobed condition of the nucleus, often suggesting a process of amitotic division (fig. 3-D).

While all of these age differences have been described previously, it is interesting to note that they are demonstrable in sections of brains fixed by perfusion and mounted and stained on the same slide.

The cells of the facial nucleus in the young animals are typical large motor cells. They contain large, discrete, heavily stained blocks of Nissl substance (fig. 2A). The nuclei are very clear and the nucleoli sharply outlined with deeply stained chromatin granules. The cells of this nucleus in the senile mice present a considerably more varied appearance than in the young. Those chosen for illustration in figure 2B were selected as resembling most closely those in younger animals. They do show large blocks of Nissl material but there seems to be at least some qualitative age difference between the appearance of the cytoplasm, while the nuclei are considerably different, with powdery chromatin and less sharply defined nucleoli. There are individual cells and groups of cells in the facial nucleus of the old animals which are properly called hypochromatic, with very little Nissl material and often showing the nucleus and cytoplasm so similarly stained as to make differentiation between them very difficult.

The cells of the dentate nucleus in the perfused brains of young mice have discrete and deeply stained granules of Nissl material. The nuclei in many of the cells are clear and the nucleoli well defined with prominent chromatin associated with them. In the senile animals the majority of the cells are markedly different, with pale cytoplasm and scanty Nissl material. The nuclei show the powdery chromatin and the less regular appearance of the nucleoli seen in other areas in the old animals.

DISCUSSION

The result of this comparison of age differences as seen after fixation by the perfusion and immersion methods consists essentially in the affirmation that such age differences are seen with either type of fixation. They are of the same general type in perfused as in immersed tissues. The concept of the distinction between the nerve cells of young and old animals as "real" differences thus gains considerable ground. It is hoped that this concept may be still further tested in the future by comparisons of animals of different age groups in which fresh and even living cells can be employed.

It is important in this type of study to emphasize that we must not transfer conclusions too rapidly from one species to another. Our own positive results with perfused material from the mouse may contrast with negative results by others on the guinea pig due to a species difference rather than to differences in technical processes or interpretative ability.

SUMMARY

Twenty-five mice of the C57 Black stock have been studied in an attempt to see whether age differences, previously described, are affected by manner of fixation, in particular whether fixation by perfusion gives preparations in which such differences are less readily seen than in those made after fixation by immersion.

Synchronous staining of the sections of brain, e.g., staining of the sections from young and old mounted in alternate rows on the same slide,

shows that brain tissue from young adults stains more deeply with cresyl violet than does that from old animals.

Individual cells, including the Purkinje cells and those of the facial nucleus and the dentate nucleus, show consistent age differences when perfused material is studied. These differences are similar to those seen in material fixed by immersion.

REFERENCES

1. Andrew, W.: The Nissl Substance of the Purkinje Cell in the Mouse and Rat from Birth to Senility. *Ztschr. f. Zellforsch. u. mikr. Anat., 25:* 583-604, 1936.
2. Andrew, W.: The Effects of Fatigue Due to Muscular Exercise on the Purkinje Cells of the Mouse, with Special Reference to the Factor of Age. *Ztschr. f. Zellforsch. u. mikr. Anat., 27:* 534-554, 1937.
3. Andrew, W.: The Purkinje Cell in Man from Birth to Senility. *Ztschr. f. Zellforsch. u. mikr. Anat., 28:* 292-304, 1938.
4. Andrew, W.: The Golgi Apparatus in the Nerve Cells of the Mouse from Youth to Senility. *Am. J. Anat., 64:* 351-375, 1939.
5. Andrew, W.: Neuronophagia in the Brain of the Mouse as a Result of Inanition and in the Normal Aging Process. *J. Comp. Neurol., 70:* 413-435, 1939.
6. Andrew, W.: Structural Alterations with Aging in the Nervous System. *Proc. Assn. Res. Nerv. & Ment. Dis., XXXV:* 129-170, 1956.
7. Andrew, W., and Cardwell, E. S., Jr.: Neuronophagia in the Human Cerebral Cortex in Senility and in Pathologic Conditions. *Arch. Path., 29:* 400-414, 1940.
8. Dolley, D. H.: Further Verification of Functional Size Changes in Nerve Cell Bodies by the Use of the Polar Planimeter. *J. Comp. Neurol., 27:* 299-324, 1917.
9. Gellerstedt, N.: Zur Kenntnis der Hirnveränderungen bei der normalen Altersinvolution. *Upsala läkaref. förh., 38:* 193-408, 1933.
10. Harms, J. W.: Morphologische und experimentelle Untersuchungen an alternden Hunden. *Ztschr. Anat., 71:* 319-382, 1924.
11. Harms, J. W.: Alterserscheinungen im Hirn von Affen und Menschen. *Zool. Anz., 74:* 249-256, 1927.
12. Hodge, C. F.: Changes in Ganglion Cells from Birth to Senile Death. Observations on Man and Honeybee. *J. Physiol., 17:* 129-134, 1894.
13. Inukai, T.: Loss of Purkinje Cells with Age in the Albino Rat. *J. Comp. Neurol., 45:* 1-33, 1928.
14. Salimbeny, A. T., and Gery, I.: Contribution a l'Étude de l'Anatomie Pathologique de la Vieillesse. *Ann. Inst. Pasteur, 8:* 557-610, 1912.
15. Speigel, A.: Über die degenerativen Veränderungen in der Kleinhirnrinde im Verlauf des Individualcyclus vom Cavia cobaya Marcgr. *Zool. Anz., 79:* 173-183, 1928.
16. Wilcox, H. H.: Changes accompanying Aging in the Brains of Guinea Pigs (Abstract). *J. Gerontol., 6 (Suppl. to No. 3):* 168, 1951.
17. Windle, W. F.: Personal Communication, 1957.

THE AGING HEART

I. Endocardium

JAMES B. McMILLAN, M.B., Ch.B.* AND MAURICE LEV, M.D.†
(From the Department of Pathology, Mount Sinai Hospital of Greater Miami, Miami Beach, Florida)

The endocardial lining of the heart shows great structural variation from chamber to chamber throughout life and a detailed study of the gross and microscopic morphology in normal hearts from fetal life to old age would seem valuable from several points of view: 1) to indicate the plasticity of this lining membrane, and as a corollary; 2) to observe from a study of its structure whether or not any functional role might reasonably be assigned to it in the normal heart; 3) to correlate, if possible, the aging changes in the endocardium with those in arteries and veins, as described previously (15, 16, 17, 19); 4) to serve as a baseline for future studies of the endocardial changes in heart diseases, both congenital and acquired.

REVIEW OF LITERATURE

There are in the literature numerous detailed descriptions of endocardial histology, both normal and pathologic. A brief survey of the more important studies relevant to our work is given below.

Luschka (20) distinguished 4 endocardial layers which he designated as 1) epithelium (squamous), 2) "longitudinal fibers," 3) elastic tissue, and 4) connective tissue, and stated that muscle fibers were always present in the endocardium. Königer (14) described beneath the endothelium 1) a very fine subendothelial layer made up of fine fibrils, ground substance and cells with abundant cytoplasm, but devoid of elastic fibers, 2) a thick layer of elastic fibers occasionally, especially in pathologic cases, separated from the subendothelial layer by a thin connective tissue layer, 3) a connective tissue layer rich in elastic fibers. He also noted the difference between the thin ventricular and thick atrial endocardium. Nagayo (23) gave a detailed description of the histology of the endocardium in all four chambers of the heart, differentiating the following layers: 1) endothelial layer, consisting of endothelium and a very thin subendothelial layer as described by Königer; 2) inner connective tissue layer of collagen and elastic fibers, the latter being more numerous in the deeper part of this layer where it merges with the underlying elastic lamina; 3) elastic lamina composed of abundant elastic fibers; 4) outer connective tissue layer consisting mainly of collagen with a few coarse elastic fibers.

Submitted for publication September 23, 1958.
This investigation was supported by a research grant (H-1187) from the National Heart Institute of the National Institutes of Health, U. S. Public Health Service.
* Bayshore Exchange Club Fellow in Cardiovascular Pathology. Now at the Good Samaritan Hospital, Dayton, Ohio.
† Present address: Congenital Heart Disease Research and Training Center, Hektoen Institute, Chicago, Illinois.

In certain areas, particularly the outflow tract of the left ventricle and in both atria, he differentiated a muscle fiber layer, lying between the elastic lamina and the outer connective tissue layer. This is often found within, or merging with, the elastic lamina.

Nagayo gave a detailed account of the development and distribution of endocardial muscle bundles in the left ventricle, and believed that the inner connective tissue layer was a constant finding not confined only to pathologic hearts. Benninghoff's (1) description follows closely that of Nagayo. Walmsley (30) distinguished an endothelial layer, membrana propria, and a subendocardial layer. The membrana propria varies in different sites and generally consists of: 1) a loose layer of delicate fibrillar tissue (subendothelial layer); 2) a connective tissue layer with many elastic fibers forming membranes in the inner part of the layer, while in the outer part they are coarse and not grouped together; 3) smooth muscle fibers which may be found within the previous layer, and which are most abundant in the outflow areas of the left ventricle.

The subendocardium consists mainly of fibrous tissue with scattered coarse elastic fibers and contains the vascular network of the endocardium and the terminal ramifications of the conduction system. This description agrees generally with that given by Maximow and Bloom (21), who note that the subendocardium is absent from the papillary muscles and chordae tendineae.

Miller and Perkins (22) studied the elastic tissue in hearts aged 2 days, 35 years, and 85 years. They noted a progressive increase in thickness of the atrial endocardium with age, along with an increase in the number and distribution of the endocardial elastic fibers, stratification of the elastica being a prominent feature of the older heart. By contrast, the ventricular endocardium showed relatively little increase in its elastic fiber content. The authors concluded that with advancing age there is an increase in the elastic tissue content of the heart.

In a study of the left atrial lesions in rheumatic fever, Gross (11) reviewed the histologic range of normality of the left atrial endocardium in sections from 50 normal hearts, ranging in age from birth to the eighth decade. He differentiated between the endocardium proper and the subendocardium, distinguishing in the former three zones, an inner, a middle, and an outer third. Among the age period changes noted were a marked diminution in cellularity from birth to the third decade, focal irregularity of the endocardial elastica from the second year of life, fat accumulation in the subendocardium from the third decade, increase in endocardial smooth muscle from the fourth decade, stratification of the elastica in older hearts with atrophy of elastic fibers, and the appearance of endocardial reduplications, usually collagenous, occurring with increasing frequency in older hearts.

Gasparini (9) noted an increase in endocardial smooth muscle with age, mainly in the atrial endocardium, and observed the same change in hypertrophied hearts. He postulated a single explanation for both findings, an increase in the resistance required of the endocardium due in the one case to a senile myocardium and in the other to an increased quantity of blood in the chamber.

It is of interest to note that both Luschka (20) and Nagayo (23) considered the endocardium to be structurally analogous to the whole blood vessel wall, not to the intima alone. Favaro (8) noted that the endocardium was continuous not only with the intima, but also with the medial coat of the great veins, the adventitia of which was continuous with the interstitial myocardial tissue; he was unable to confirm or deny a similar relationship between the endocardium and the great arteries due to the intervening annuli fibrosi. Von Glahn (29) observed that the inner elastic fibers of the endocardium are often collected into a definite bundle resembling the internal elastic lamella of larger arteries.

MATERIAL AND METHODS

Gross Study.—The material consisted of normal hearts (i.e., hearts showing no gross or microscopic evidence of significant cardiac pathology), removed routinely at autopsy in this hospital between 1951 and 1955. After being opened according to a standard technique, the chambers were packed with cotton and the hearts fixed in 10% neutral buffered formalin. It was realized that fixation tended to exaggerate the extent and intensity of endocardial opacities, so the original material was supplemented by 30 normal fresh hearts. Table 1 lists the number of hearts examined grossly. The youngest specimen was from a fetus of 5 months maturity, the oldest from a female age 82.

In each heart observations were made and recorded for each chamber regarding the location and extent of endocardial opacities, the presence of endocardial plaques and corrugations, and the occurrence of fat infiltration. To confirm the validity of these observations, checks were made from time to time at the autopsy table on other hearts.

Microscopic Study.—This was divided into three main groups:

a) A pilot study was made of 16 representative hearts from the collection, covering all age groups. Photographs were made of all gross endocardial changes in the hearts, to provide a permanent record for comparison with the histology. Eighty-six blocks of tissue from representative areas showing gross changes were stained with Hematoxylin and Eosin and with Weigert-van Gieson stain. In this manner, the changes of endocardial hypertrophy and endocardial sclerosis in each chamber were clearly defined grossly and microscopically.

b) The main histologic study consisted of 40 hearts, 4 from each age group. Ten blocks of tissue were taken from each heart in the first two age groups and 13 from each heart in the other groups. In all hearts the anterior, posterior, and septal endocardium of the 4 chambers were examined histologically, whether or not the endocardium showed gross changes.

A convenient arrangement was to include in vertical blocks of tissue the atrial and ventricular endocardium, plus the intervening valve ring and valve leaflet. Blocks from the ventricular septum frequently included either the pulmonic or aortic valve cusps. Representative blocks of tissue in each age group were taken from areas such as the crista terminalis, atrial appendages, the trabeculae, and papillary muscles of the ventricles. Sections from all blocks were stained with H & E, and with Weigert-van Gieson stain.

c) Ninety-five representative blocks of tissue were taken from 29 hearts, including 13 recently fixed hearts (3 days to 1 month fixation). In addition to routine elastic and H & E stains, sections from all blocks were stained for reticulum, glycoproteins (periodic acid-Hotchkiss stain), and tissue metachromasia (Azure A stain).

TABLE 1. LIST OF NUMBER OF HEARTS EXAMINED GROSSLY.

	Age Groups (Years)										
	Fetal	Birth-1	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-82	Total
Number Examined	30	9	7	5	14	22	25	28	22	13	175

In a further 10 recently fixed hearts (age 6 months to 70 years), sections taken from each chamber were stained for fat (oil Red O and Sudan IV). Sections from 3 hearts in this group (ages 32, 62, 70) were also stained for calcium (Alizarin Red).

RESULTS

Gross Changes of the Endocardium with Advancing Age

General.—On the whole the atrial endocardium is much thicker than that of the ventricles, areas of thickening being visible as greyish white opacities of the endocardium. Of the two atria, the left has a more uniformly thick endocardium while the right shows a more focal type of thickening. The endocardium of both ventricles also shows a focal type of thickening of much smaller degree than the atrial endocardium. The changes in the left ventricular endocardium are more pronounced than those in the right ventricle. The gross changes in each chamber will now be described in detail from fetal life to old age.

Right Atrium.—At about the sixth month of fetal life, small zones of gray-white opacity appear over the proximal part of the limbus fossae ovalis, extending into the superior caval orifice, and at the orifice of the inferior vena cava. These zones, at first discontinuous, tend to merge with each other by the end of fetal life. Also, at term, the chamber shows slight thickening of the endocardium over the posterior crest and at the base of the anterior tricuspid valve leaflet. In the first months of extra-uterine life there is obvious increase in the extent and intensity of the endocardial thickening. The whole limbus and fossa ovalis are completely opaque, the opacity extending around the caval orifices, though tending to spare the posterior part of the superior caval opening (fig. 1). Zones of lesser thickening are seen on the posterior crest and on the anterior crest. By the end of the first year of life, the gross pattern of endocardial opacity resembles that of the adult heart. About one third to one half of the endocardial surface shows varying degrees of opacity. At this early age also, the thickening in certain areas is so pronounced and so distinct from the surrounding endocardium as to suggest early plaque formation. These areas are the limbus and endocardium adjacent to the venae cavae. By the end of the first decade these zones are markedly thickened and plaque-like, but only slight loss of translucency is noted on the posterior and anterior crests. The appendage, pectinate muscles, and the area above the tricuspid ring remain covered by translucent thin endocardium. In the second decade, small circumscribed zones or

Fig. 1. Right atrium and ventricle, age 6 weeks. The fossa ovalis and limbal region of the atrial endocardium show white opacity in contrast to the surrounding translucent endocardium in atrium and ventricle.

Fig. 2. Right atrium, age 70. Note the patchy distribution of endocardial opacity with plaque formation in the fossa ovalis and on the limbus.

plaques of thickening quite frequently appear at the base of the anterior and posterior tricuspid leaflets. Thickening of the Thebesian valve is absent in the first decade, present thereafter. The anterior portion of the superior caval orifice is more thickened than the posterior portion, while the endocardium around the inferior caval orifice seems to be uniformly thickened. After age 20 the changes consist mainly of accentuation of these zones of opacity. The appendage, the pectinate muscles, the orifice of the coronary sinus, and an area on the interatrial septum at the base of the medial tricuspid leaflet are consistently uninvolved in any endocardial thickening. In the fourth and fifth decades small fat spots appear in the septum, and fat is seen in the region of the AV node. Fat deposition is most pronounced in those hearts with much epicardial fat. Its incidence diminishes significantly after age 60. In these later decades there is some accentuation of the plaques of thickening noted on the limbus and around the caval orifices. The endocardium often shows focal wrinkling. In the seventh and eighth decades the changes are similar (fig. 2). Occasionally some older hearts show less pronounced changes than those of previous decades, but the essential pattern of endocardial thickening remains unchanged throughout the series.

Right Ventricle.—This chamber shows the least endocardial thickening of the 4 (fig. 1). Ill-defined light streaks of endocardial opacity are seen in fetal life at the base of the pulmonic valve. In the first decade a few linear streaks of similar nature may be seen in the pulmonary conus. By adult life small opaque spots are noted on the papillary muscles and trabeculae, the anterior wall being more involved than the posterior wall. These changes are not uniformly present in all hearts examined. With advancing age little or no increment is noted in distribution or intensity of the slight focal opacities. In the fifth decade a few fat spots are occasionally seen in the crista supraventricularis. In the later decades of life the changes remain relatively inconspicuous, the most heavily involved zone being that portion of the conus subjacent to the pulmonic valve where zones of slight opacity are present (fig. 3).

Left Atrium.—At all ages this chamber is the most heavily involved of the 4, and is the only one in which the endocardial thickening can be truly described as diffuse. This begins in the latter half of fetal life as a slight opacity implicating the posterior wall, the orifices of the pulmonary veins, and the orifice of the appendage. These zones of thickening soon coalesce until, by the seventh month of fetal life, about half of the endocardium shows slight diffuse opacity, including the atrial appendage. An area of translucent thin endocardium remains on the septum primum and that portion of the septum distal to it. At term the posterior atrial

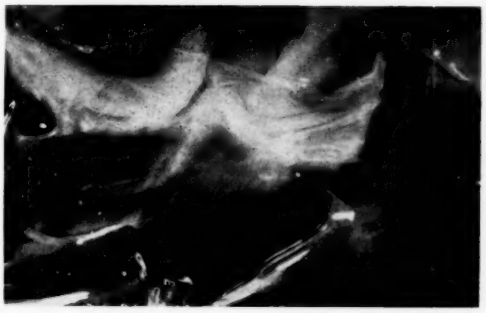


Fig. 3. Right ventricle, age 70. Focal opacities are seen at the base of the pulmonic valve cusps.

Fig. 4. Left atrium and ventricle, age 6 weeks. In the atrium, the posterior and anterior walls show diffuse opacity while the septal endocardium is relatively translucent. The ventricular endocardium is generally translucent.

Fig. 5. Left atrium, age 70. There is diffuse endocardial opacity with pronounced wrinkling, particularly on the posterior wall.

endocardium is markedly opaque and an occasional circumscribed plaque of endocardial thickening is noted on this wall. With closure of the foramen ovale the septum primum rapidly becomes thick and opaque, and by the end of the first year most of the endocardium shows some degree of opacity (fig. 4). The basic pattern of diffuse endocardial thickening is established in the first decade. A relatively translucent area of thin endocardium persists above the anterior mitral valve leaflet near the valve commissure. This remains as a small unaffected area near the base of the septum until the fourth decade. By age 20 plaque formation with pronounced corrugation of the endocardium is constant in the posterior wall. Similar corrugations occur frequently at the orifices of the appendage and pulmonary veins, where they "fan out" onto the septum in a radial fashion. Thereafter there is a general augmentation of thickening until the sixth decade when the maximum gross changes seem to have been attained. At this age the endocardium is a thick gray-white membrane with zones of pronounced wrinkling. In all age groups the posterior wall shows the most marked thickening, and the area near the base of the anterior mitral valve leaflet the least thickening (fig. 5). No flow lines can be demonstrated due to the generalized opacity. The only other gross change worth noting is the frequent appearance of fat spots in the fifth and sixth decades of life.

Left Ventricle.—In general, the endocardial changes are more pronounced than in the right ventricle, although generally focal in nature, and are more pronounced in the outflow tract than in the inflow tract. The areas of greatest thickening are at the base of the septum, the endocardium subjacent to the mitral valve leaflets, and the papillary muscles. In fetal life slight endocardial opacity is first noticed in the anterior septum at the base of the aortic valve in the region of the pars membranacea. At term there are occasional linear gray-white streaks part way along the anterior and posterior radiations of the left bundle branch. The papillary muscles show slight thickening on their luminal aspects. In the first year of life the septal thickening becomes more diffuse, and at the same time small zones of endocardial opacity develop on the ventricular wall, subjacent to both the anterior and posterior mitral valve leaflets. This process is more marked beneath the anterior leaflet. The posterior papillary muscle shows a small circumscribed plaque on its anterior aspect near the tip by the end of the first decade. By the end of the second decade the zone of thickening subjacent to the anterior mitral leaflet has merged with the slight diffuse thickening of the interventricular septum, which now extends about halfway from base to apex. This thickening is most marked beneath the right and posterior aortic cusps. An increase in intensity of this opacity frequently demarcates the underlying radiations of the left bundle branch. In the third decade small plaques appear on the trabeculae near the apex. In the fourth decade there is marked increase in the diffuse thickening of the septal endocardium from base to apex. The anterior wall of the ventricle shows zones of slight opacity diminishing from base to apex and not so intense as that in the septum. The endocardium of the smooth portion of the septum shows the most pronounced degree of thickening and small circumscribed plaques become a common finding in this area after age 40. In middle age also fat spots are noted in many hearts, usually in the septum and anterior wall. The later years of life are marked by a slight diminution in the septal thickening, but the incidence of circumscribed plaques of opacity remains unchanged (fig. 6). The posterior wall, apart from the papillary muscles, shows only slight focal endocardial thickening, most pronounced in the older age groups.

Fig. 6. Left ventricle, septum, age 70. The endocardium at the base of the septum is consistently thickened.

Histologic Changes of the Endocardium with Advancing Age

Group I (Fetal Hearts).—No attempt will be made to give any detailed description of the embryology or cytology of the fetal endocardium. To avoid possible confusion, the inclusive term "endocardial lining" is used to denote both endocardium proper and subendocardium.

In the first half of fetal life the endocardial lining of all chambers is extremely simple, consisting of a thin layer of collagen and reticular fibers underlying the endothelium. By the end of the fifth month a few elastic fibers appear focally in the atrial endocardium lying between the endothelial and collagen layers. The elastic fibers become progressively more abundant and prominent in those areas which show grossly developing opacity. By the eighth month of fetal life the pattern of endocardial histology is established in the atria as follows:

1) Endothelial layer, underlying which is

2) A prominent elastic layer composed in its inner part of a compact network of fine elastic fibers, and in its outer part of thicker elastic fibers, muscle fibers, and fine collagen fibers. The elastic fibers are generally oriented parallel to the surface. In the left atrium the elastic layer tends to be thicker than that in the right atrium, and the muscle fibers are more prominent.

Layers 1) and 2) constitute the endocardium proper beneath which is

3) Subendocardium consisting of a compact mass of collagen fibers with coarse elastic fibers interlacing among them. In the inner part of the subendocardium these elastic fibers often lie parallel to those of the elastic layer, while in the outer part they may be oriented at right angles to the surface as they dip down into the intermuscular septa of the myocardium. In the outer part also, fine elastic fibers are occasionally seen interlacing with the coarser elastic fibers. The left atrial subendocardium contains more elastic fibers than the right.

This histologic pattern is seen to greater or lesser extent diffusely throughout the left atrium, but in the right atrium only those zones of opacity noted grossly show well pronounced layering. The major part of the endocardial lining of the right atrium consists of endothelium overlaying very thin layers of elastica and collagen.

The atrial endocardium proper is quite cellular in fetal life. The endothelial layer is composed of oval cells with prominent cytoplasm, while the underlying elastic layer contains many cells, most resembling those of the endothelial layer, others being fibroblastic in appearance.

In contrast to the atria, the ventricular endocardial lining is extremely simple in fetal life. It consists predominantly of a few elastic and reticular fibers underlying the endothelium. The subendocardium is absent in many places, appearing only where the lining membrane is more robust. Where present it is thin but compact and shows no elastic tissue. Small foci of elastic fiber hypertrophy are seen in the trabecular recesses and at points of flow such as the pulmonary conus, the base of the septum beneath the aortic valve ring, and on the luminal side of the papillary muscles.

In the fully mature fetus zones of hypertrophy are prominent in the atria. This hypertrophy consists of a proliferation of fine elastic fibers in the elastic layer, prominence of the muscle fibers in the deeper part of the endocardium proper, and thickening of the subendocardium with increase in its elastic content. Fine collagen fibers are occasionally present in the hypertrophic elastic layer. An elastic lamella may be seen in the zones of hypertrophy, separating the endocardium proper from the subendocardium. Where muscle fibers are prominent the lamella tends to disappear, but at its point of disappearance it is seen to lie external to the muscle. No significant subendothelial layer is noted in any fetal heart, but fine reticular fibers are found in the innermost zone

of the elastic layer immediately subjacent to the endothelium. These hypertrophic changes are most marked in the limbus and fossa ovalis of the right atrium and on the anterior and posterior walls of the left atrium. Where the venae cavae and pulmonary veins join the atria, the endocardium proper shows a combined collagenous and coarse elastic hypertrophy which is continuous with the intima and media of the veins.

Retrogressive changes are already discernible, although slight, at fetal maturity. Constant findings in zones of marked endocardial hypertrophy are a beginning disorientation of the elastic fibers, and a variable stainability of their basement membranes. Glycoprotein and reticulum stains reveal focal thickenings of the basement membranes of isolated elastic fibers which stand out sharply against a more or less homogeneous background. These changes are interpreted as being the earliest evidence of endocardial sclerosis.

Group 2 (First Year).—In the first year of life endocardial hypertrophy becomes prominent due mainly to an increase in the elastic layer (fig. 7). The left atrial endocardial lining is generally much thicker than the right except on the septum primum. Elastic hypertrophy involves the anterior and posterior walls of the left atrium diffusely and the major portion of the septum and atrial appendage. In the right atrium the limbus, fossa ovalis, and contiguous areas alone show prominent hypertrophy. Foci of elastic proliferation are seen in addition on the anterior and posterior walls above the tricuspid valve. The endocardial lining of both atria becomes very thin prior to its incorporation into the atrioventricular valve leaflets. These areas become predominantly collagenous by the end of the first year of life.

In the left ventricle pronounced elastic and muscle hypertrophy is seen at the base of the septum. The subendocardium here is compact and shows many elastic fibers. This is the only area of the ventricular endocardial lining which approaches the atria in thickness (fig. 8). Elsewhere in the ventricles foci of elastic hypertrophy occur mainly in the outflow tracts. The subendocardium of both ventricles is more prominent than before, although absent over large areas of both chambers, and the left ventricular subendocardium contains more elastic fibers than the right.

Retrogressive changes are more marked than in the previous group. Disorganization and fragmentation of the elastica with focal collagen replacement of the elastic fibers is pronounced in the zones of greatest hypertrophy (fig. 9). The cellularity of the endocardium proper diminishes appreciably, and those cells which are present are fibroblastic in appearance. In addition focal lymphocytic infiltration and vascularization of the deeper part of the endocardium proper occurs occasionally in these areas.

Group 3 (1-9 years).—By the end of the first decade endocardial hypertrophy is generally

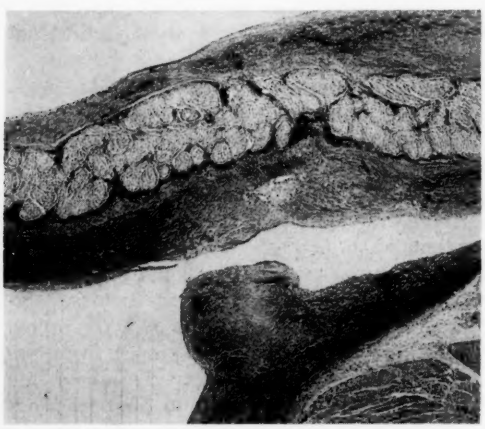


Fig. 7. Limbus and septum primum, age 6 months. The right atrial cavity is below, the left above. Elastic endocardial hypertrophy is marked in both chambers. Weigert-van Gieson x32.

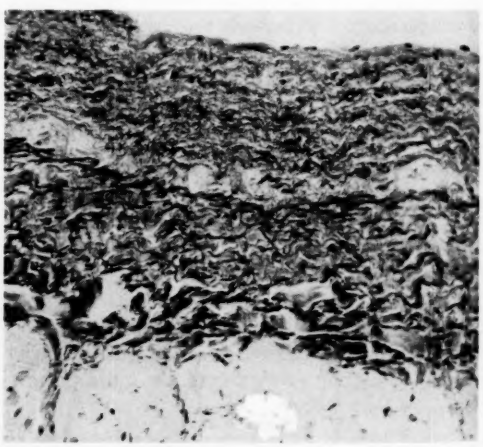


Fig. 8. Left ventricle, septum, age 8 months. Endocardial hypertrophy. The endocardium proper shows prominent elastic and muscle layers and there is proliferation of the subendocardial elastica. Weigert-van Gieson x240.

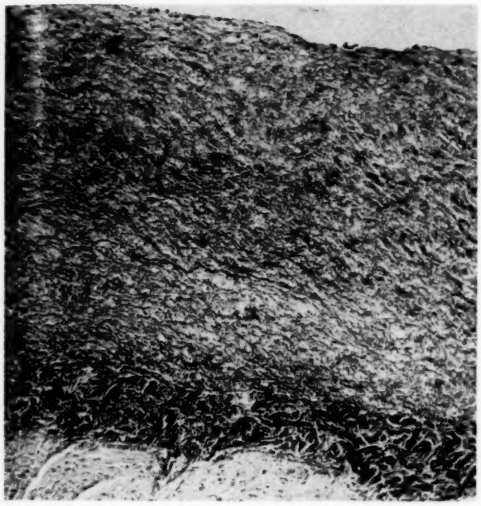


Fig. 9. Left atrium, age 6 months. Endocardial hypertrophy and early sclerosis. The fibers in the elastic layer begin to show disorganization and variation in size, and areas of collagenization appear. Note the compact, relatively thin subendocardium. Weigert-van Gieson x140.

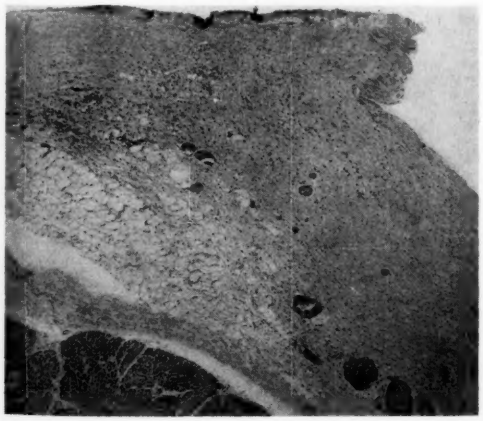


Fig. 10. Right atrium, limbus, age 19. Endocardial hypertrophy and sclerosis. Vascularization and lymphocytic infiltration are prominent, and there is fat infiltration into the subendocardium and deeper endocardium. H & E x50.

submaximal in all chambers. The pattern is similar to that already described for the previous groups. Additional features are an increased prominence of the ventricular subendocardium in zones of hypertrophy and foci of elastic hypertrophy on the pectinate muscles of the right atrium and the trabeculae of the ventricles, particularly the left ventricular septum. There is also a tendency to loss of distinction between endocardium proper and subendocardium in the atria, and a rudimentary elastic lamella is sometimes seen running through the mid-portion of the elastic layer, in effect creating two elastic layers. Additional retrogressive changes in the atria consist of increased mononuclear cell infiltration and vascularization of the endocardium proper, commencing fragmentation of the subendocardial elastica, and focal fat infiltration into the subendocardium.

The ventricles show a similar increment in hypertrophy and sclerosis. A notable feature is the occurrence of foci of collagenous sclerosis in the absence of significant elastic hypertrophy. This is seen predominantly in the trabecular recesses of both ventricles, but may occur elsewhere in the ventricular endocardial lining.

Group 4 (Second decade).—In the second decade tags of elastic tissue similar to the Lambl's excrescences of the valves are seen occasionally on the limbus and on the posterior wall of the left atrium. Sclerotic changes become more pronounced with marked disorganization of the elastica, increasing vascularization of the endocardium proper, and increased fat infiltration of the subendocardium, especially in the atria (fig. 10).

Group 5 (Third decade).—By early adult life endocardial hypertrophy is maximal in extent of distribution, although not necessarily in degree since small increments may be seen in later years, particularly in the atria. A thin subendothelial layer of fine reticular fibers and a few fine elastic fibers are seen focally in the atria, notably on the anterior and posterior walls of the left atrium and on the limbus of the right atrium. This appears as a "clear" zone above the elastic layer which in turn shows increasing stratification of the elastic fibers (fig. 11). There is accentuation of previously noted sclerotic changes in all chambers. Increased collagenization of the elastic layer and commencing collagenization of the subendothelial "clear" layer correspond to the endocardial plaques noted grossly. The more dis-

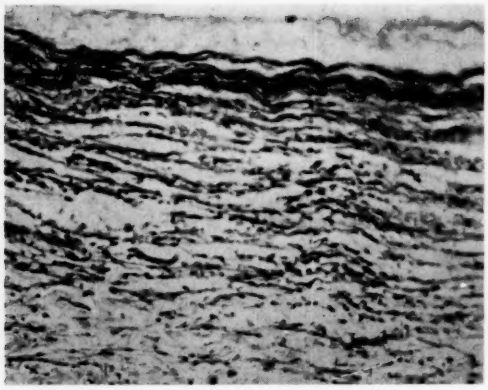


Fig. 11. Left atrium, age 22. Endocardial hypertrophy and sclerosis. A thin subendothelial layer is seen, containing a few fine elastic fibers. The elastic layer shows fragmentation and stratification of the fibers. Weigert-van Gieson x240.

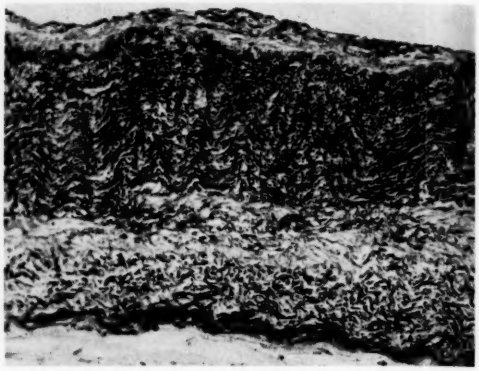


Fig. 12. Left atrium, age 62. Endocardial hypertrophy and sclerosis. A collagenous endocardial reduplication is seen superficially. The elastica is rugose and the muscle fibers are prominent. The subendocardium is less compact than in fig. 9. Weigert-van Gieson x120.

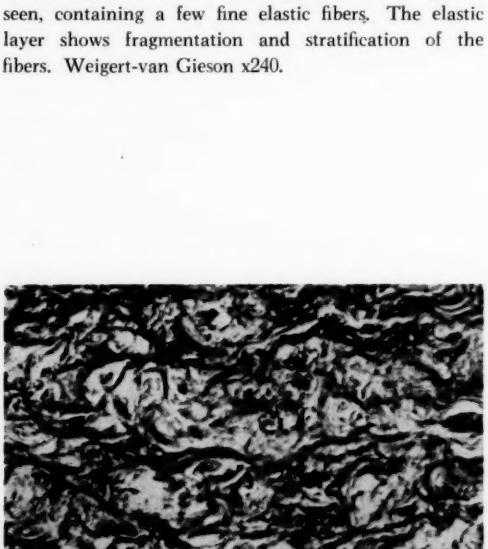


Fig. 13. Detail of muscle layer of previous figure to show vacuolization of fibers with prominent fibroelastic septa among the muscle bundles. Weigert-van Gieson x706.

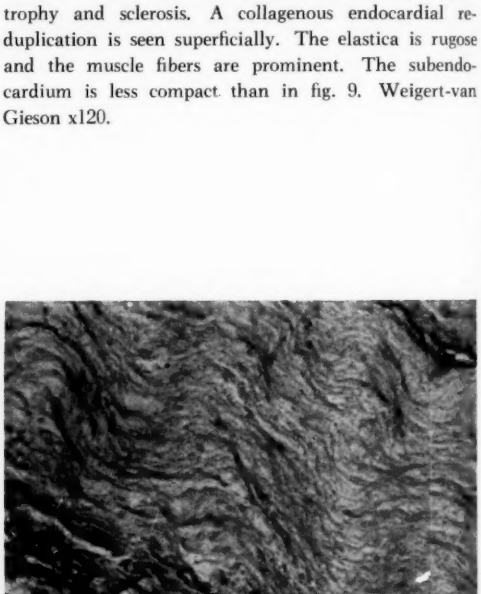


Fig. 14. Left atrium, age 62. Note the marked irregular thickening of basement membranes of the elastic fibers (above) and muscle fibers (below). Hotchkiss' modification of P.A.S. stain x706.

tinct the plaque is on gross inspection, the more collagenous it is histologically.

Groups 6 and 7 (Fourth and fifth decades.)—The subendothelial layer, present only focally throughout the atria, becomes predominantly collagenous by the fifth decade of life, and seems to be identical with the collagenous reduplications of the endocardium described by Gross (11). There is now pronounced waviness or rugosity of the elastic fibers, particularly in the left atrium, and abundant collagen is present in the interstices between the fibers. Foci of hyaline sclerosis are also seen in the elastica. The subendocardium shows increased fat infiltration, some of the fat cells penetrating into the endocardium proper. Elsewhere the elastic tissue content of the subendocardium seems augmented, the fibers being thick and short, as if fragmented.

In these age groups the contrast between the ventricles is striking, the left ventricle showing more prominent hypertrophic and sclerotic changes. The hypertrophy and sclerosis of the basal left ventricular septum approaches that of the atria and its endocardial muscle is increased.

Groups 8 and 9 (Sixth and seventh decades).—Collagenous endocardial reduplications are common in both atria, and there is marked acellularity of the elastic layer with generalized sclerosis (fig. 12). Collagenous reduplications are now seen in the outflow tracts of both ventricles. The subendocardium is less compact in appearance, due not only to the fat infiltration but also to apparent diminution in size of the collagen bundles within the subendocardium. After age 50 there is obvious collagen and elastic fiber replacement of the muscle bundles in the endocardium, with vacuolization of the fibers (fig. 13). In the left atrium the muscle fibers, although showing these retrogressive changes, seem to be more prominent than in early adult life, notably on the posterior wall (fig. 12).

Irregular increased stainability of the elastic and muscle fiber basement membranes, noted previously as an early retrogressive change, is now pronounced (fig. 14). In these decades also there is a noticeable variation in the intensity of the hypertrophic and sclerotic changes from heart to heart, although all show basically the same type of retrogressive changes. This finding corresponds with the gross impression of variability in the later decades.

An additional finding of importance is the occurrence after age 60 of foci of lipid infiltration in the endocardium proper. Lipid is not seen at all prior to the seventh decade, and thereafter only in the left atrium where the endocardial lining is thickest, notably on the posterior wall. The lipid tends to be confined to the superficial endocardium, being dispersed focally along and between the elastic fibers (fig. 15). A few lipid droplets are also seen in the endocardial muscle bundles.

Group 10 (Eighth decade).—In this decade maximal sclerotic changes are seen in all chambers generally. These may be summarized as follows:

In the endocardium proper:

1) Fragmentation, disorientation, and stratification of the elastica, with pronounced rugosity of the elastic layer.

2) Frequent basement membrane irregularities (reticular and glycoprotein components).

3) Hyaline sclerosis and acellularity of the elastica.

4) Collagenous endocardial reduplications.

5) Slight lipid infiltration (left atrium only) in ground substance and along elastic fibers.

6) Fatty metamorphosis of endocardial muscle with collagen and elastic fiber replacement.

7) Focal hypertrophy of endocardial muscle (left atrium).

In the subendocardium:

1) Loss of "cohesion" of subendocardium.

2) Fat infiltration (adiposity).

3) Increase in elastic tissue with eventual disorganization of the elastic fibers.

4) Focal basement membrane irregularities as in the endocardium.

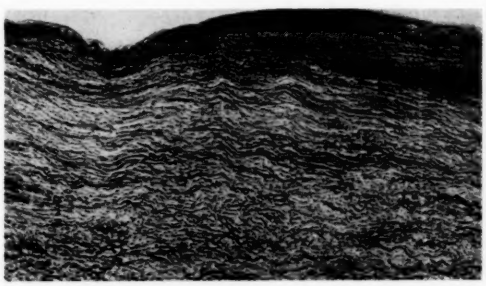


Fig. 15. Left atrium, age 70. The dark areas represent focal lipid infiltration in the superficial endocardium. Sudan IV counterstained with elastica x160.

It should be noted that the major portion of the endocardial lining of the ventricles, even in advanced age, consists of a thin elastica overlying a very thin collagenous subendocardium with no marked hypertrophic or retrogressive changes. In many of these areas there is a thin subendothelial zone of reticular fibers similar to the "clear" zone noted earlier in the atria.

Additional studies

1) No significant metachromasia was noted in the definitive development of endocardial hypertrophy and sclerosis from late fetal life onwards. In addition stains for calcium were consistently negative in all chambers, and, as stated above, lipid infiltration was confined to the left atrium of older hearts. However, as the sampling of material and the staining methods were limited, we cannot deny the possibility of earlier and more extensive lipid infiltration nor of focal calcification of the elastica.

2) By means of an eyepiece micrometer, approximate measurements were made of endocardial thickness (both endocardium and subendocardium). These are summarized in table 2.

DISCUSSION

Factors influencing endocardial hypertrophy.—It has been stated by Hass (12) that mechanical forces exert an influence on the genesis and development of the elastica. The zones of localized endocardial hypertrophy found in the right atrium, right ventricle, and left ventricle of normal hearts almost certainly represent forms of direct irritational hyperplasia of the elastic, collagenous, and muscular tissue of the endocardium in response to some type of mechanical stress. This may result from localized turbulence of the blood stream, from a "lift" effect on the endocardium due to the velocity of the blood column reducing lateral pressure at certain points on the endocardial surface, or from a "jet" effect caused by impact of the blood column on the endocardial surface.

In a study of the veins at varying ages, Lev and Saphir (16) noted the occurrence of endophlebohypertrophy in regions of hydrodynamic stress, and concluded that this represented flow lines, or beginning septa, in regions of divided or disturbed flow. That such disturbed flow can occur in the veins more readily than was heretofore realized is the conclusion of Helps and McDonald (13). Flow in veins is generally accepted as being laminar or streamline in type, the aorta being the only blood vessel in man giving a Reynold's number greater than 2,000, the critical number above which flow becomes turbulent. (The Reynold's number depends in part on the velocity of flow and the diameter of the tube.) The authors concluded that with Reynold's numbers of 500 and above (a figure easily surpassed in larger veins) the flow pattern would easily be broken by marked changes in the flow rate or by external deformation of the vessel and that turbulence might occur at junctions of flow at a value considerably below the critical one. It would seem then that localized eddies or turbulences can readily occur in larger veins and so provide the mechanical stress responsible for endophlebohypertrophy. In the same way focal endocardial hypertrophy might develop.

Rodbard (26) demonstrated in physical models the development of intimal cushions at points of increased velocity of flow and thus of reduced lateral pressure. In other words a "lift" effect is produced on the intima at these points. The intima is normally held in a state of "pressure atrophy" due to the high prevailing lateral pressure in the arteries according to this postu-

TABLE 2. RANGE OF ENDOCARDIAL THICKNESS.

Age	Right Atrium	Left Atrium	Right Ventricle	Left Ventricle
Birth	50-250μ (limbus)	200-500μ (posterior wall)	<50μ	<100μ (septum) <50μ elsewhere
First Year	800μ (limbus) 50-300μ elsewhere	900μ (posterior wall)	<100μ (conus) <50μ elsewhere	<200μ (septum) <50μ elsewhere
Adult	800μ (limbus) 50-300μ elsewhere	900μ (posterior wall) 600μ (anterior wall)	<150μ (conus) <50μ elsewhere	200-300μ (septum) <150μ (papillary muscle) <50μ elsewhere

late. Similarly, the occurrence of endocardial thickenings in a given region was attributed by Chun Chang (7) to the absence of pressure of blood or friction in that region. Such a "lift" effect due to reduced lateral pressure might be the stimulus for focal endocardial hypertrophy, particularly on the walls of the atrium above the atrioventricular ring, and on the septal wall of the left ventricle below the aortic valve ring.

Diastolic endocardial "pockets" may occur in the septum of the left ventricle in cases of insufficiency of the aortic valve, and are considered to be the result of the regurgitating blood column impinging on the septum (28). These lesions arise principally as circumscribed thickenings before becoming established as pockets. In a similar manner the impact of the blood columns from the venae cavae, albeit acting with less force, might produce circumscribed endocardial thickening in the right atrial septum, and the column passing through the mitral valve might produce focal thickening on the posterior papillary muscle.

Whether as a result of turbulences, of a "lift" effect, or of jet impact, direct irritational hyperplasia would seem to be the mechanism of localized endocardial hypertrophy.

On the other hand diffuse endocardial hypertrophy as seen in the left atrium is not susceptible of similar explanation. It is reasonable to suggest that this phenomenon, occurring as it does in the normal heart, is at least a partial expression of the normal function of the left atrial wall. If this be so a consideration of the tension developed within the atrial wall, acting as an indirect form of mechanical stress, might help to explain the hypertrophy. The tension within a membrane separating two spaces is deduced from the law of Laplace, which states that the pressure differential (P) across the membrane and the tension (T) within it are related by an equation involving its principal radii of curvature. The equation is

$$P = T\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

$$\text{Units: Dynes/cm.}^2 = \text{dynes/cm.}\left(\frac{1}{\text{cm.}} + \frac{1}{\text{cm.}}\right)$$

If, for the sake of simplicity, we consider the left atrium as a sphere, the principal radii of curvature are equal and are those of the chamber itself. As Woods (31) and later Burton (6) in their application of the Laplace theorem, pointed out, the thickness of the heart wall at any point bears a direct proportion to the relative tension at that point. The original equation can be written $P = kt\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$ where k is the tension per unit thickness of wall in square centimeters and t the thickness of the wall.

Tables 3 and 4 give very approximate values for k in the left and right atrium. The pressure P is admittedly difficult to estimate. Green (10) states that right atrial pressure oscillates between -7 and $+16$ mm. Hg relative to atmospheric pressure. We have taken a mean effective pressure of 4 mm. Hg (i.e., excess pressure within the chamber over the

TABLE 3. TENSION (K) IN DYNES/CM². LEFT ATRIUM AT DIFFERENT AGES.

Age	Circumference (mm.)	R(mm.)	t(mm.)	$t\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$	P(dynes/cm.²)	k(dynes/cm.²)
Birth	43.7	7	1.58	0.45	up to 18,620	up to 41,380
1 — 5	59.7	9.5	1.56	0.33	up to 18,620	up to 56,420
16 — 20	101.8	16.2	2	0.25	up to 18,620	up to 74,480
61 — 70	118	18.8	2	0.21	up to 18,620	up to 88,670

TABLE 4. TENSION (K) IN DYNES/CM². RIGHT ATRIUM AT DIFFERENT AGES.

Age	Circumference (mm.)	R(mm.)	t(mm.)	$t\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$	P(dynes/cm.²)	k(dynes/cm.²)
Birth	49	7.8	1.27	0.33	up to 5,320	up to 16,120
1 — 5	70	11.1	1.15	0.21	up to 5,320	up to 25,330
16 — 20	123.2	19.6	2	0.2	up to 5,320	up to 26,600
61 — 70	140.5	22.4	2	0.18	up to 5,320	up to 29,550

negative intrathoracic pressure). For the left atrial pressure, Green quotes a figure of 5 mm. Hg, which would give a range of effective pressure between 8 and 14 mm. Hg (negative intrathoracic pressure −3 mm. Hg in expiration to −9 mm. Hg in inspiration). The measurements of atrial circumference and those of atrial thickness in childhood are taken from Poppi (24), and the measurements of atrial thickness in adults from Saphir (27).

It should be emphasized that these values for k are approximate and certainly conservative. Since the atria are cuboidal rather than spherical, the principal radii of curvature are in fact larger, and thus the tension developed will be greater. The effective pressure within the atria, especially the left, is also considerably greater from time to time, which would serve further to increase the tension in the walls. However, the calculations serve to demonstrate the greater tension within the left atrial wall compared with the right and the rapid increment in tension in the first years of life compared with later years. Burton (5) gives a figure of 500,000 dynes/cm.^{2} for the ventricles. Comparable figures for arteries are, aorta 170,000 dynes/cm.^{2} (5), large arteries 60,000 dynes/cm.^{2}, coronary arteries 20,000 dynes/cm.^{2} (3).

It can readily be seen that the hydrostatic tension in the left atrial wall may be considerably higher than that in large arteries.

However, a demonstration of higher tension prevailing in the left atrial wall as compared with the right does not suffice alone to explain the diffuse endocardial hypertrophy in that chamber. We must consider also how this tension is achieved. If it is an active tension provided solely by muscle, then there is no need for endocardial hypertrophy. This is the case in the ventricles where the much greater tension, and therefore the force, is a function of the thick muscular walls. Thus in the normal ventricle there is no diffuse endocardial hypertrophy. If, on the other hand, this tension is mainly or partly a maintenance tension, an explanation can be found for the development of a thick elastic tissue lining. According to Burton (5), maintenance tension is mediated predominantly and most effectively by elastic tissue; in fact, the main function of this tissue is to provide such tension with a minimum expenditure of energy. He showed that a close correlation existed between the amount of elastic tissue in blood vessels and the degree of maintenance tension required of them. There is evidence to indicate that the left atrium is in part, if not mainly, a conduit similar to the blood vessels, and that provision of maintenance tension may be an important part of its function. In direct observations on dogs, Prinzmetal and associates (25) found that movements rarely occurred in the main body of the left atrium during systole or diastole, the atrium serving mainly as a conduit and not as a contracting organ. The right atrium, however, showed active symmetrical contractions. Even under conditions of increased work the main portion of the left atrium remained passive, while the left atrial appendix and the right atrium contracted vigorously. Braunwald and associates (4), in recording simultaneous left and right atrial pressure pulses in normal subjects, found evidence to suggest that right atrial contraction was more vigorous than left atrial contraction. Both they and Little (18) considered the left atrium to be less distensible than the right (this could perhaps be predicted in view of the diffuse elastic endocardium on the left). A study of the sequence of events in the cardiac cycle shows that atrial contraction is of generally minor importance in ventricular filling, most of the blood passing into the ventricles by recoil before the onset of atrial systole. Therefore, although obviously left atrial contraction, and therefore the development of active tension, does occur, it may be that provision of maintenance tension is an important function of the left atrium.

Turning once again to the ventricles we note the occurrence of endocardial hypertrophy in certain pathologic states. In aneurysmal dilatation of the left ventricle due to old infarction, the aneurysmal sac is generally lined by a thick opaque endocardium. This may well represent compensatory elastic hypertrophy in an attempt to provide adequate tension in the presence of underlying myocardial disease. Black-Shaffer (2) has cogently pointed out that infantile endocardial fibroelastosis may be due to mechanical forces rather than to inflammation or anoxia. In a greatly dilated heart, where the hydrostatic tension is greatly increased over normal, and in the presence of underlying myocardial disease, a thick elastic endocardium is the only possible provider of adequate tension.

It is suggested therefore that the diffuse endocardial hypertrophy of the left atrium may

be an expression of the more dominant role of maintenance tension in the function of that chamber. It is also a reflection of the higher tension prevailing in the left atrial wall as compared with the right. The left atrial endocardium is thinnest in an area on the septum where conceivably the pressure differential across the wall, and therefore the tension, is lower, due to the abutting right atrium. The rapid increment in endocardial hypertrophy in the first years of life shows some correlation with the increment of intramural tension as calculated in tables 3 and 4. This tension rises sharply in the first decade or so, increasing more slowly thereafter.

It is not suggested that hydrostatic tension alone causes endocardial hypertrophy in the left atrium. There is the superimposed effect of direct irritational hyperplasia as seen in the other chambers, notably on the posterior wall and at the entries of the pulmonary veins. As a result these areas of endocardium are markedly wrinkled and opaque and, as measured microscopically, show thickening in excess of that found elsewhere in the atria or ventricles.

Factors influencing endocardial sclerosis: Relationship to changes in arteries and veins.—Endocardial sclerosis would seem to be the result of prolongation and intensification of the same mechanical stresses responsible for endocardial hypertrophy. In certain areas of the ventricles we note the development of endocardial sclerosis in the absence of any marked endocardial hypertrophy; in other words, sclerosis outweighs hypertrophy. This is difficult to explain, but some clarification can be gained from a study of the changes in blood vessels. Lev and Saphir (15) and Littman, Lev and Saphir (19) found endophlebohypertrophy and sclerosis to be aggravated by increased venous pressure which appeared to act in both a direct and indirect manner, i.e., laterally and tangentially. Similarly, in the aorta, Lev and Sullivan (17) found changes beginning in fetal life and progressing with age which they characterized as endarteriohypertrophy and endarteriosclerosis with atheromatosis (atherosclerosis). In the aorta the retrogressive and sclerotic changes far outweigh the hypertrophic changes, fat and calcium being prominent. In the veins, both hypertrophy and sclerosis are quite prominent, with less calcium and fat deposition than in the aorta. In the endocardium, with the exception of foci in the ventricles, which have a high hydrostatic pressure, hypertrophy outweights sclerosis with minimal fat and no calcium deposition.

It would seem then that when sclerosis predominates over hypertrophy the prevailing hydrostatic pressure is high. This is not to say that sclerosis always predominates in high pressure regions. Factors such as turbulence or high velocity may well be more important prevailing influences on the intima or endocardium than high hydrostatic pressure and as a result zones of prominent hypertrophy develop, e.g., on the septum of the left ventricle and near the orifices of branches of the aorta. It is worth noting that this hypertrophy of the septal endocardium may be due in part to the very high hydrostatic tension required of the septum, which structurally is at a "mechanical disadvantage" due to its comparatively flat surface.

The ventricular muscle is obviously paramount in absorbing all forms of mechanical stress to the walls of the chamber. Thus we have large areas, indeed the major part of the ventricular endocardium, devoid of significant hypertrophic or sclerotic changes throughout life. In the absence of more exact knowledge of this protective action the role of hydrostatic pressure in the development of endocardial sclerosis remains speculative.

Finally, it should be stated that no simple hemodynamic explanation probably is forthcoming for the whole complex of changes occurring in endocardium, veins, and arteries with the passage of time. The deductions in this discussion are advanced tentatively as factors influencing these changes in the endocardium, a structure more plastic and possibly more functional than is generally realized.

SUMMARY

A gross and microscopic study has been made of the changes with age in the endocardium of normal human hearts. Grossly a progressive gray-white thickening develops within the first decade, focally in the right atrium and both ventricles, and diffusely in the left atrium. With advancing age, these circumscribed areas become more prominent and geographic. In the left atrium similar plaques become superimposed on the diffuse thickening. Histologically the focal and diffuse thickening represents endocardial hypertrophy, i.e., a proliferation of the elastic, collagen, and muscle fibers of the endocardium. In areas of hypertrophy, de-

generative changes occur, or endocardial sclerosis, consisting of: 1) fragmentation and disorganization of elastic fibers, 2) irregular staining of elastic fiber basement membranes, 3) collagenous endocardial reduplications with hyaline sclerosis of elastica, 4) slight lipid infiltration of elastica and muscle, and 5) vacuolization and focal hypertrophy of smooth muscle cells. The subendocardium proper also shows changes with advancing age, notably elastosis, fat infiltration, and loss of cohesion of the collagen and elastic fibers.

Factors influencing the development of these changes are discussed. Focal endocardial hypertrophy, as seen in the right atrium, right and left ventricles, seems to be a direct irritational hyperplasia resulting from any or all of the following mechanisms, namely, eddies or turbulences, reduced lateral pressure due to increased velocity of flow, or impact of the blood column on various parts of the endocardial lining. Diffuse endocardial hypertrophy as seen in the left atrium may be due to indirect mechanical stress, namely, hydrostatic tension. Evidence is adduced that provision of elastic tension may be an important function of the left atrial wall. Endocardial sclerosis results from a prolongation of the mechanical stresses responsible for endocardial hypertrophy.

The relationship of these changes to those in arteries and veins is also discussed. There seems to be some correlation between predominance of sclerosis and a prevailing high hydrostatic pressure. Thus arteries show severe endarteriosclerosis and relatively less endarteriohypertrophy, veins show marked endophlebohypertrophy and relatively less sclerosis, and endocardium generally shows the least sclerosis in relation to the degree of hypertrophy.

REFERENCES

1. Benninghoff, A.: Das Wandendokard, in: *Handbuch der mikroskopischen Anatomie des Menschen,* Von Möllendorf ed., Bd. 6, Teil 1, 162-171, Julius Springer, Berlin, 1930.
2. Black-Shaffer, B.: Infantile Endocardial Fibroelastosis, a Suggested Etiology. *Arch. Path., 63:* 281-305, 1957.
3. Blumenthal, H. T.: Response Potentials of Vascular Tissue, Part II, C, Hemodynamic Factors. *Geriatrics, 11:* 554-568, 1956.
4. Braunwald, E., Fishman, A. P., and Cournand, A.: Time Relationship of Dynamic Events in the Cardiac Chambers, Pulmonary Artery and Aorta in Man. *Circulation Res., 4:* 100-107, 1956.
5. Burton, A. C.: Relationship of Structure to Function of the Tissues of the Wall of Blood Vessels. *Physiol. Rev., 34:* 619-642, 1954.
6. Burton, A. C.: The Importance of the Shape and Size of the Heart. *Am. Heart J., 54:* 801-810, 1957.
7. Chun Chang: On the Reaction of the Endocardium to the Bloodstream in the Embryonic Heart, with Special Reference to the Endocardial Thickening in the Atrioventricular Canal and Bulbus Cordis. *Anat. Rec., 51:* 253-265, 1931-32.
8. Favaro, G.: Intorno ai Rapporti di Continuita fra Endocardio e Tuniche Vascolari. *Anat. Anz., 35:* 534, 1910.
9. Gasparini, F.: Sulla Struttura dell' Endocardio Parietale dell' Uomo in Condizioni Normali e Patologiche. *Bol. Soc. Ital. Biol. Sper., 22:* 605-607, 1946.
10. Green, H. D.: Normal Cardiac Physiology, in: *Pathology of the Heart,* S. E. Gould, Ed., Charles C Thomas, Springfield, Ill., 1953.
11. Gross, L.: Lesions of the Left Auricle in Rheumatic Fever. *Am. J. Path., 11:* 711-736, 1935.
12. Hass, G. M.: Elastic Tissue. *Arch. Path., 27:* 336-365 and 583-613, 1939.
13. Helps, E. P. W., and McDonald, D. A.: Observations on Laminar Flow in Veins. *J. Physiol., 124:* 631-639, 1954.
14. Köniğer, H.: Histologische Untersuchungen über Endokarditis. *Arb. path. Inst., Lepzig, 1:* 1-162, 1903.
15. Lev, M., and Saphir, O.: Endophlebohypertrophy and Phlebosclerosis, II. The External and Common Iliac Veins. *Am. J. Path., 28:* 401-411, 1952.
16. Lev, M., and Saphir, O.: Endophlebohypertrophy and Phlebosclerosis, I. The Popliteal Vein. *Arch. Path., 51:* 154-178, 1951.
17. Lev, M., and Sullivan, C. M.: The Relationship of Aging Changes to the Development of Arteriosclerosis in the Human Aorta (Abstract). *J. Gerontol., 6, Suppl. 3:* 118, 1951.
18. Little, R. C.: Volume Elastic Properties of the Right and Left Atrium. *Am. J. Physiol., 158:* 237-240, 1949.
19. Littman, M. C., Lev, M., and Saphir, O.: Endophlebohypertrophy and Phlebosclerosis, III. The Left Innominate Vein and Superior Vena Cava. *Angiology, 4:* 301-311, 1953.
20. Luschka, H.: Das Endocardium und die Endokarditis. *Virchows Arch. path. Anat., 4:* 171-191, 1852.
21. Maximow, A. A., and Bloom, W.: *A Textbook of Histology,* 6th ed. W. B. Saunders Co., Philadelphia & London, 1952.
22. Miller, A. M., and Perkins, O. C.: Elastic Tissue of the Heart in Advancing Age. *Am. J. Anat., 39:* 205-217, 1927.
23. Nagayo, M.: Zur normalen und pathologischen Histologie des Endocardium parietale. *Beitr. path. Anat., 45:* 283-305, 1909.

24. Poppi, A.: Studio di Biometria del Cuore nel Cadavere in Condizione Normale e Patologiche, Nota II, Nostre Conoscenze sulla Biometria del Cuore nel Cadavere. *Arch. pat. e clin. med., 20:* 143-206, 1939.

25. Prinzmetal, M., Corday, E., Brill, I. C., Oblath, R. W., and Kruger, H. E.: *The Auricular Arrhythmias.* Charles C Thomas, Springfield, Ill., 1952.

26. Rodbard, S.: Vascular Modifications Induced by Flow. *Am. Heart J., 51:* 926-942, 1956.

27. Saphir, O.: *Autopsy Diagnosis and Technic,* 2nd ed. Paul B. Hoeber, Inc., New York, 1946.

28. Saphir, O.: Endocarditis, in: *Pathology of the Heart,* S. E. Gould, Ed., Charles C Thomas, Springfield, Ill., 1953.

29. Von Glahn, W. C.: Auricular Endocarditis of Rheumatic Origin. *Am. J. Path., 2:* 1-14, 1926.

30. Walmsley, T.: The Heart, in: *Quain's Anatomy,* Vol. IV, Part III, Longmans Green & Co., London, 1929.

31. Woods, R. H.: A Few Applications of a Physical Theorem to Membranes in the Human body in a State of Tension. *J. Anat. & Physiol., 26:* 362-370, 1892.

EFFECTS OF AGE AND OF KREBS-CYCLE METABOLITES ON THE INHIBITION OF MOUSE BRAIN RESPIRATION BY PENTOBARBITAL*

MARIE-LOUISE DESBARATS-SCHONBAUM,† M.Sc. AND MARION K. BIRMINGHAM, Ph.D.
(From the Gerontologic Unit, Allan Memorial Institute of Psychiatry, McGill University, Montreal)

Old people exhibit a decreased tolerance to barbiturates, a fact attributed to impaired detoxication mechanisms (9, 13). In view of the hypothesis that the anesthetic power of barbiturates may be linked with their inhibitory effect on the respiration of brain tissue (7, 8), the possibility was considered that this inhibition might become more pronounced with age. This was not the case. Instead, the inhibition of respiration by pentobarbital was found to vary with age in the same manner as respiration itself, and a significant positive correlation between rate of respiration and sensitivity to barbiturate inhibition became apparent.

METHODS

The study was conducted on R. A. P. mice of both sexes, ranging in age from 1 to 586 days. The age distribution was as follows: under 1 month, 24; 1 to 2 months, 11; 3 to 6 months, 5; 11 to 20 months, 10 mice. The animals were decapitated without anesthesia. The brains were removed, weighed, and homogenized with the apparatus of Potter and Elvehjem (6) in either of two media: 1) calcium-free Krebs-Ringer phosphate solution, with glucose as substrate (117 mM NaCl, 3.0 mM KCl, 0.4 mM KH_2PO_4, 1.2 mM $MgSO_4$, 22 mM sodium phosphate buffer, pH 7.4, and 9.5 mM glucose); 2) a medium developed more recently by Krebs (4) that contains, in addition, bicarbonate, pyruvate, fumarate, and glutamate (98 mM NaCl, 4.7 mM KCl, 1.2 mM KH_2PO_4, 1.2 mM $MgSO_4$, 3.6 mM $NaHCO_3$, 13.8 mM sodium phosphate buffer, pH 7.4, 12.0 mM glucose, 4.9 mM sodium pyruvate, 4.9 mM sodium-L-glutamate, and 5.4 mM sodium fumarate). The final tissue concentration was 5%. Oxygen uptake was measured in the Warburg apparatus at 38 C. with air as the gas phase. Sodium pentobarbital was added just before incubation. Its final concentration was either 0.3 or 1.5 mM.‡ At the end of a 90-minute incubation period, the pH was recorded with a glass electrode.

Where indicated, results were analyzed statistically by the procedures outlined in Snedecor (11) under "group comparisons," and by calculating correlation coefficients.

RESULTS

Variation of oxygen uptake with age. The respiration rate in the absence of the drug was lowest in both types of medium with brain suspensions obtained from newborn mice, increased rapidly with age to a maximum during the third month, after which there seemed to be a slight decline with further advance in age (fig. 1). This pattern was observed whether the rates of oxygen uptake were calculated on the basis of fresh or dry weight. The ability of the tissue suspensions to maintain their rate of oxygen uptake over a 90-minute period followed a similar course. The steadiest rates were obtained with three-month-old animals; the greatest fall-off in respiration rate with time occurred in the very young (fig. 2).

With Krebs' supplemented medium the oxygen uptake of brain suspensions in the absence of pentobarbital was increased by an average of 32% (table 1). The pH at the end of the experimental period was close to the optimum for the oxygen uptake of brain suspensions (1) with either medium but significantly higher in the medium containing the supplements (pH ± S.E.: 6.88 ± 0.022, and 7.27 ± 0.055, respectively).

Inhibition of oxygen uptake by sodium pentobarbital. The addition of sodium pentobarbital caused a maximal inhibition of nearly 30% with concentrations of 0.3 mM/1, and 80%

Submitted for publication December 10, 1958.

* This work was supported by grant MP-210 of the National Research Council of Canada to Dr. Karl Stern.

† Present address: Department of Pathological Chemistry, University of Toronto, Toronto, Ontario, Canada.

‡ A dose of 50 mg. sodium pentobarbital per kilogram causes temporary anesthesia in the mouse or rat. If one assumes even distribution of the drug throughout the body, this amount would result in a concentration of approximately 0.2 mM. Destruction of the drug by the liver and other tissues would of course lower this value. The plasma concentration of sodium pentobarbital in the mouse and rat at time of awakening after anesthesia has been found to be about 0.1 mM (12). McIlwain (5) lists pentobarbital concentrations of 0.2 mM required for surgical anesthesia, of 0.14 to 0.2 mM for blocking synaptic transmission, and of 1.8 mM for blocking axonal conduction.

with 1.5 mM/l (figs. 3 and 4). The curves for percentage inhibition in relation to age paralleled those for oxygen uptake. Thus, the percentage inhibition was lowest with brains from newborn animals, when respiration rates in the absence of the drug were lowest, and increased rapidly to a maximum around the third month. With further increase in age there was a statistically significant decrease in inhibition at the lower concentration of pentobarbital. With the higher concentration the negative correlation was not statistically significant, however. In figure 5 the percentage inhibition has been plotted against rate of oxygen uptake. A significant positive correlation between respiration rate and percentage inhibition was found with both concentrations of the drug in the unsupplemented medium. In the medium containing Krebs-cycle intermediates and bicarbonate, the correlation did not attain statistical significance at the higher concentration of the drug, possibly because the inhibition was nearly maximal.

Comparison of the barbiturate effect in the two types of medium showed that the greatest inhibition occurred in the medium in which the highest rates of oxygen uptake were obtained in the absence of the drug. Thus, in the presence of 1.5 mM pentobarbital the respiration rates were reduced to nearly the same low level in both media (table 1). The higher concentration of pentobarbital also abolished age differences in respiration rate (fig. 6).

DISCUSSION

The observation that brain suspensions prepared from immature mice are less sensitive to barbiturate inhibition than those from adult

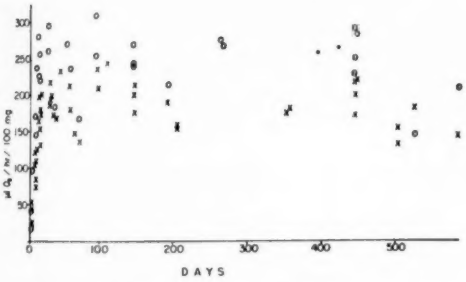


Fig. 1. Variation of oxygen uptake of mouse brain suspensions with age. x, calcium-free Krebs-Ringer phosphate solution with glucose; o, Krebs' supplemented medium.

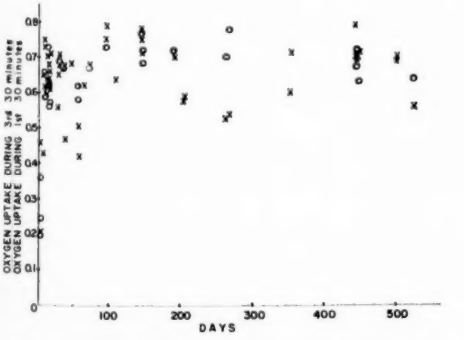


Fig. 2. Variation of the maintenance of respiration rate with age. Symbols as in figure 1. The fall-off in respiration rate was significantly greater with animals younger than 60 days than with older animals (x, $P < 0.02$; o, $P < 0.01$).

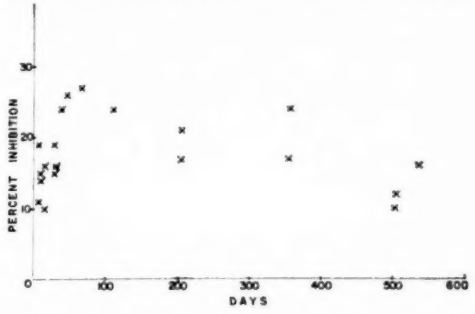


Fig. 3. Variation with age of the inhibition of respiration by 0.3 mM sodium pentobarbital. Ca-free Krebs-Ringer phosphate solution with glucose. The respiration rates, during the first hour, of aliquots from the same tissue suspensions incubated with and without pentobarbital have been compared. Mice < 100 days: $r = 0.80$ ($P < 0.001$); > 100 days: $r = -0.73$ ($P < 0.02$).

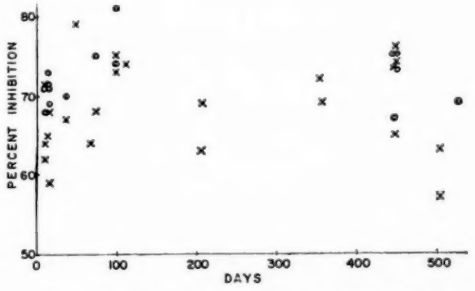


Fig. 4. Variation with age of the inhibition of respiration by 1.5 mM sodium pentobarbital. Symbols as in figure 1. Mice < 100 days: x, $r = 0.55$ ($P < 0.05$); o, $r = 0.80$ ($P < 0.01$); mice > 100 days: x, $r = -0.23$ (not significant); o, $r = -0.42$ (not significant).

animals recalls similar results of Himwich and associates (3) with minced rat brain. The fact that the inhibitory effect on brain respiration decreased again with further advance in age indicates that direct inhibitory effects on brain respiration are not responsible for the decreased tolerance to the drug in old age.

According to current concepts brain tissue must be stimulated, either electrically (5) or by the addition of potassium ions (2), to insure a significant inhibitory response to narcotics. With suspensions of mouse brain in ordinary Ringer type medium, significant effects were obtained in this work with a pentobarbital concentration of 0.3 mM (see footnote on page 284). With a concentration of 1.5 mM the major part of the oxygen uptake was suppressed. Similar findings have been reported by Webb and Elliott (14). The magnitude of the inhibitory response did, however, apparently depend upon tissue activity as is indicated by the correlation between respiration rate and percentage inhibition. The observation that respiration rates of mouse brain suspensions were inhibited to a greater extent in medium containing precursors and members of the citric acid cycle than in ordinary Krebs-Ringer medium is in accord with the view that one (not necessarily the only, or main) site of action of barbiturates is related to the operation of the citric acid cycle (7). The maximum respiration rates and maximum sensitivity of brain respiration to the barbiturate in the young adult may then reflect the importance of reactions necessitating the functioning of the cycle at this stage and a lessening of their importance with aging. Recent experiments by Samson and associates (10) on survival time of rats subjected to anoxia combined with iodoacetate poisoning have led these authors to similar conclusions. As in the present work the maximum effect was seen in the young adult and with advancing age the response reverted to that of the very young.

TABLE 1. EFFECT OF KREBS-CYCLE METABOLITES ON THE OXYGEN UPTAKE OF BRAIN SUSPENSIONS IN THE ABSENCE AND PRESENCE OF PENTOBARBITAL.

$\mu l\ O_2$ consumed per hour by suspensions from mice of all ages.

Medium	No Pentobarbital	1.5 mM Pentobarbital
Ca-free Ringer-phosphate glucose	165 ± 7.4* N = 47	57 ± 1.6 N = 23
Krebs' supplemented medium	218 ± 13.3 N = 29	63 ± 3.4 N = 38

* S.E.; addition of Krebs' cycle supplements caused a highly significant increase in oxygen uptake in the absence of the drug ($P < 0.001$) but had no significant effect in its presence ($0.2 > P > 0.1$).

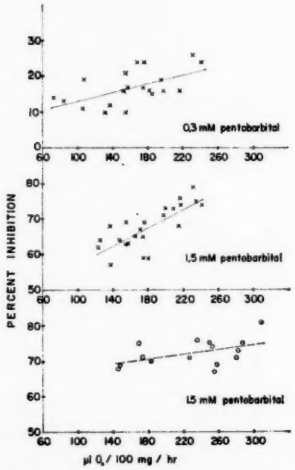


Fig. 5. Relation between respiration rate of brain suspensions and inhibition by sodium pentobarbital. Symbols as in figure 1. Upper graphs: $r = 0.57$ ($P < 0.01$) and 0.77 ($P < 0.001$). Lower graph: $r = 0.49$ ($0.1 > P > 0.05$).

Fig. 6. Suppression by sodium pentobarbital of the variation of mouse brain respiration rate with age. Pentobarbital concentration 1.5 mM; symbols as in figure 1.

SUMMARY

The effects of age and of sodium pentobarbital on the rate of oxygen uptake of brain suspensions from 50 mice between 1 and 586 days of age were studied. The respiration rate of mouse brain suspensions and the inhibitory effect upon respiration of sodium pentobarbital are lowest with tissue from very young animals, increase to a maximum in the young adult, and

decrease again with further advance in age. There is a statistically significant correlation between respiration rate in the absence, and percentage inhibition in the presence, of the barbiturate. With calcium-free Ringer-phosphate-glucose solution, oxygen uptake may be inhibited by nearly 30% in the presence of 0.3 mM, by 80% with 1.5 mM pentobarbital. With Krebs' supplemented medium (also calcium-free) both respiration rate and inhibitory response to the barbiturate are increased.

The effects upon respiration of age and of supplements to the medium are abolished in the presence of 1.5 mM pentobarbital.

REFERENCES

1. Elliott, K. A. C., and Birmingham, M. K.: The Effect of pH on the Respiration of Brain Tissue; the pH of Tissue Slices. *J. Biol. Chem., 177:* 51-58, 1949.
2. Ghosh, J. J., and Quastel, J. H.: Narcotics and Brain Respiration. *Nature, 174:* 28-31, 1954.
3. Himwich, H. E., Sykowski, P., and Fazekas, J. F.: A Comparative Study of Excised Cerebral Tissues of Adult and Infant Rats. *Am. J. Physiol., 132:* 293-296, 1941.
4. Krebs, H. A.: Body Size and Tissue Respiration. *Biochim. et Biophys. Acta, 4:* 249-269, 1950.
5. McIlwain, H.: *Biochemistry and the Central Nervous System.* J. and A. Churchill Ltd., London, 1955.
6. Potter, V. R., and Elvehjem, C. A.: A Modified Method for the Study of Tissue Oxidations. *J. Biol. Chem., 114:* 495-504, 1936.
7. Quastel, J. H.: Biochemical Aspects of Anaesthesia. *Proc. 3rd Int. Congr. Bioch.,* 496-504, 1955.
8. Quastel, J. H., and Wheatley, A. H. M.: Narcosis and Oxidations of Brain. *Proc. Roy. Soc. London B, 112:* 60-79, 1932.
9. Rovenstine, E. A.: Geriatric Anesthesia. *Geriatrics, 1:* 46-53, 1946.
10. Samson, F. E., Jr., Balfour, W. M., and Dahl, N. A.: The Effect of Age and Temperature on the Cerebral Energy Requirement in the Rat. *J. Gerontol., 13:* 248-251, 1958.
11. Snedecor, G. W.: *Statistical Methods.* Iowa State College Press, Ames, 1940.
12. Spector, W. S.: Editor. *Handbook of Biological Data.* W. B. Saunders Co., Philadelphia, 1956.
13. Watts, E. H.: Anesthesia in the Aged. *Geriatrics, 2:* 88-95, 1947.
14. Webb, J. L., and Elliott, K. A. C.: Effects of Narcotics and Convulsants on Tissue Glycolysis and Respiration. *J. Pharmacol., 103:* 24-33, 1951.

THE 5-NUCLEOTIDASE ACTIVITY OF HUMAN ARTERIAL TISSUE IN INDIVIDUALS OF VARIOUS AGES*

J. E. KIRK, M.D.

(From the Division of Gerontology, Washington University School of Medicine, St. Louis)

The presence in human arterial tissue of 5-nucleotidase, a specific phosphatase which acts only on adenosine-5-monophosphate and inosine-5-monophosphate, was first reported by Reis (6) in 1950, who in subsequent publications (1, 7) presented further details concerning the properties of this enzyme. The observation by Reis of a high activity of 5-nucleotidase in human arterial tissue was later confirmed by Antonini and Weber (2) through chemical and histological studies. Histological observations on the localization of the enzyme in the arterial wall have further been reported by Newman and his associates (5).

The present study was undertaken with the purpose of determining the 5-nucleotidase activity of human arterial tissue samples obtained at autopsy from subjects of various ages.

MATERIALS AND METHODS

Ninety-seven samples of the thoracic descending aorta, 86 samples of the pulmonary artery, and 57 samples of the coronary artery were included in the study.† The enzyme activity determinations were performed on aqueous homogenates of intima-media layers of the arteries; the procedure employed was a modification of that described by Ahmed and Reis (1). In the case of the aortic and coronary artery samples measurements were made both on normal and arteriosclerotic tissue portions of the same blood vessels. All reagents used in the experiments were prepared with glass-distilled water. The tissue nitrogen and cholesterol analyses were carried out as previously reported (3).

The final millimolar concentrations used (total volume, 3.70 ml.) were: adenosine-5-monophosphate, 3.15; manganese sulfate, 1.0; barbital, 35.0; the pH of the buffer-substrate mixture was 7.8. An amount of homogenate corresponding to 10 to 25 mg. of fresh tissue was employed in each test. A tissue test without addition of adenosine-5-monophosphate was run with each sample and reagent blanks with and without adenosine-5-monophosphate with each set of analyses. Glassware cleaned with warm HCl and rinsed with glass-distilled water was used throughout the tests.

The samples were incubated for 15 minutes at 38 C., and 1.0 ml. aliquots of the incubation mixture were removed at 0 and 15 minutes. Each aliquot was added to 0.2 ml. of 30% trichloroacetic acid contained in a test tube placed in ice water. After centrifugation, 500 cu.mm. of the supernatant were used for determination of orthophosphate. The colorimetric phosphate determination was performed as previously described (3).

The K_m observed for adenosine-5-monophosphate was 2.13×10^{-4}. In accordance with the observations by Ahmed and Reis (1) the 5-nucleotidase activity of the arterial tissue was found to be definitely lower in the absence than in the presence of manganese sulfate. Proportionality was noted between time of incubation and recorded enzyme activities over a 30-minute period for a 10-25 mg. tissue range and over a 20-minute period for a 10-50 mg. range. As pointed out by Reis (1, 6, 7) and by Kirk (3) the degree of interference of the nonspecific arterial phosphomonoesterase in the activity measurements of 5-nucleotidase can be considered as very small under the experimental conditions employed in the present study.

RESULTS

The mean 5-nucleotidase activities of aortic, pulmonary artery, and coronary artery samples observed for various age groups have been listed in table 1.

Aortic Samples

I. *Normal aortic tissue.*—As seen from the data recorded in table 1 a definite tendency was noted for the 5-nucleotidase activity of the tissue to increase with age. Thus the mean value observed for samples from children, expressed as millimoles of orthophosphate liberated/Gm. wet tissue/hour, was 0.060, as compared with an average value of 0.179 for samples from adults. The increase in 5-nucleotidase activity with age has been illustrated graphically in figure 1. The coefficients of correlation between age and 5-nucleotidase activity, calculated on the basis of wet tissue weight and tissue nitrogen content, were, respectively, + 0.48 ($t = 5.35$) and + 0.36 ($t = 3.56$).

II. *Arteriosclerotic aortic tissue.*—The results of comparisons between the 5-nucleotidase activities of arteriosclerotic and normal tissue portions of the same blood vessels are listed in table 2. It will be seen from the table that the mean enzyme activity of the arteriosclerotic tissue, when calculated for the total number of samples on the basis of wet tissue weight, was moderately lower than the activity of the normal tissue portions, but that no significant difference was found when the activity values were expressed on the basis of the tissue nitrogen content.

An examination was further made of the relationship between the fresh tissue inorganic phosphate content and the enzyme activity, the

Submitted for publication April 15, 1959.

* Studies on Arterial Metabolism XXIV. The investigation was supported by a grant from the National Institutes of Health, Public Health Service (PHS-891) and the Life Insurance Medical Research Fund (G-56-54).

† The author is indebted to Dr. J. J. Connor for assistance in obtaining specimens.

TABLE 1. MEAN 5-NUCLEOTIDASE ACTIVITIES OF HUMAN ARTERIAL TISSUE IN VARIOUS AGE GROUPS.

Age Group (Years)	N	Cholesterol, % of Wet Weight	mM PO_4 lib./Gm. Wet Tissue/Hour	s.d. of distr.	mM PO_4 lib./Gm. Tissue N/Hour	s.d. of distr.
Normal Aortic Tissue						
0 - 9	11	0.2	0.060	0.024	1.45	0.52
10 - 19	2	0.3	0.112	-	2.57	—
20 - 29	6	0.3	0.158	0.031	3.39	0.58
30 - 39	12	0.3	0.160	0.062	3.98	1.67
40 - 49	13	0.4	0.220	0.061	6.22	2.04
50 - 59	24	0.5	0.159	0.056	4.41	1.61
60 - 69	22	0.6	0.187	0.052	5.22	1.80
70 - 85	5	0.5	0.178	-	5.06	—
Grand Mean			0.162	0.066	4.55	2.02
Arteriosclerotic Aortic Tissue						
10 - 19	1	0.3	0.124	—	2.13	—
20 - 29	3	0.3	0.204	—	6.45	—
30 - 39	4	0.7	0.148	—	3.90	—
40 - 49	8	0.6	0.189	0.051	5.32	1.44
50 - 59	22	1.2	0.142	0.070	4.51	2.33
60 - 69	21	1.2	0.157	0.057	5.00	1.42
70 - 85	4	1.1	0.144	—	4.43	—
Grand Mean			0.156	0.061	4.73	1.92
Pulmonary Artery Tissue						
0 - 9	9	0.2	0.048	0.030	1.45	—
10 - 19	1	0.2	0.072	—	—	—
20 - 29	6	0.2	0.065	0.041	2.07	—
30 - 39	11	0.2	0.071	0.026	1.93	0.67
40 - 49	13	0.3	0.118	0.039	3.69	1.40
50 - 59	23	0.3	0.107	0.041	3.11	1.34
60 - 69	19	0.3	0.120	0.038	3.40	0.90
70 - 85	4	0.3	0.121	—	2.96	—
Grand Mean			0.098	0.047	3.01	1.38
Normal Coronary Artery Tissue						
0 - 9	5	0.1	0.067	—	1.38	—
20 - 29	5	0.2	0.097	—	3.90	—
30 - 39	6	0.2	0.102	0.035	3.53	1.04
40 - 49	7	0.3	0.096	0.046	3.73	1.06
50 - 59	9	0.5	0.120	0.049	3.19	1.53
60 - 69	9	0.5	0.139	0.060	5.47	0.70
70 - 79	3	0.3	0.118	—	3.53	—
Grand Mean			0.109	0.050	3.65	1.48
Arteriosclerotic Coronary Artery Tissue						
30 - 39	3	1.2	0.152	—	3.80	—
40 - 49	3	2.0	0.187	—	7.27	—
50 - 59	17	1.6	0.110	0.062	3.70	1.96
60 - 69	12	1.6	0.089	0.035	2.87	1.35
70 - 79	3	1.1	0.118	—	3.95	—
Grand Mean			0.113	0.057	3.65	2.05

TABLE 2. MEAN 5-NUCLEOTIDASE ACTIVITIES OF ARTERIOSCLEROTIC TISSUE EXPRESSED IN PERCENTAGE OF ACTIVITIES OF NORMAL TISSUE OF THE SAME ARTERIAL SAMPLES.

Age Group (Years)	N	Wet Tissue		Tissue Nitrogen	
		%	t of diff.	%	t of diff.
Aortic Samples					
30 - 49	12	85	1.47	87	1.16
50 - 59	22	95	0.76	102	0.24
60 - 75	24	86	2.05	94	0.62
30 - 75	58	89	2.56	95	0.89
Coronary Artery Samples					
30 - 75	26	111	0.94	111	0.81

phosphate content serving as a measure of the degree of calcification present. A marked decrease in the 5-nucleotidase activity was observed in some samples having a phosphate content above 5.0%.

Pulmonary Artery Samples

In all the age groups investigated (table 1) and in 92% of the individual samples from adults, the 5-nucleotidase activity of the pulmonary artery tissue was found to be lower than the activity of the normal aortic tissue. The average value found for samples from children was 0.048, and the mean activity recorded for samples from adults 0.104. The tendency of the enzyme activity to increase with age was similar to that observed for the aortic tissue (fig. 1). Thus the coefficient of correlation between age and 5-nucleotidase activity was + 0.49 ($t = 5.10$), when calculated on the basis of wet tissue weight, and + 0.30 ($t = 2.68$), when expressed on the basis of the tissue nitrogen content.

Coronary Artery Samples

I. *Normal coronary artery tissue.*—The mean 5-nucleotidase activities observed for the coronary artery samples from various age groups (table 1) were in general of a magnitude between those recorded for the aortic and the pulmonary artery samples. The average activities found for samples from children and adults were, respectively 0.067 and 0.110. The tendency of the 5-nucleotidase activity to increase with age was less pronounced than in the case of the aorta and pulmonary artery.

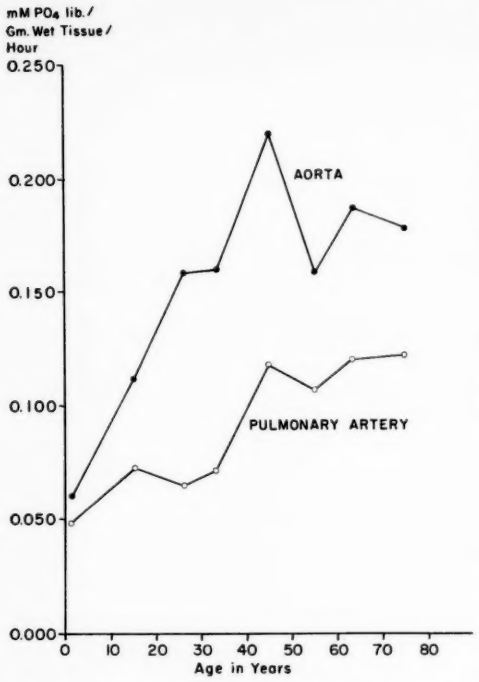


Fig. 1. Variation with age in 5-nucleotidase activity of human aortic and pulmonary artery tissue.

II. *Arteriosclerotic coronary artery tissue.*— No statistically significant difference was found between the activities of the arteriosclerotic and normal tissue portions either when calculated on the basis of wet tissue weight or tissue nitrogen content (table 2). In accordance with the observations on arteriosclerotic aortic tissue, some of the coronary artery samples having a phosphate content above 5.0% showed markedly reduced enzyme activity.

DISCUSSION

The mean 5-nucleotidase activity observed in the present study for normal adult aortic tissue (0.179 mM PO_4 liberated/Gm. wet tissue/hour) is somewhat higher than the activities found by previous investigators. Thus the average activity reported by Antonini and Weber (2) for 7 normal aortic samples was 0.123; the few examples listed in the publications by Reis (6, 7) show a mean value of about 0.078. In view of the small number of samples included in the studies by these authors an evaluation of the significance of the observed difference is not possible.

It has been shown by Reis (6) that the activity of 5-nucleotidase in the arterial tissue is higher than that found in ossifying cartilage. The high concentration of this enzyme in arterial tissue and the fact that it exhibits maximal activity near the physiological pH deserve attention. The possible significance of the enzyme for the process of calcification has been pointed out by Reis (6, 7).

An important finding resulting from the present study is the demonstration of a considerable increase in the 5-nucleotidase activity of the arterial tissue with age. A similar increase has been reported by Naidoo and Pratt (4) for the enzyme in the rat brain.

SUMMARY

Determinations were made of the 5-nucleotidase activity of 97 samples of the thoracic descending aorta, 86 samples of the pulmonary artery, and 57 samples of the coronary artery obtained from individuals of various ages. In the case of the aortic and coronary artery samples, the enzyme activity measurements were made separately on normal and arteriosclerotic portions of the same blood vessels.

The average enzyme activity of normal aortic tissue from children, expressed as millimoles of PO_4 liberated/Gm. wet tissue/hour, was 0.060. The corresponding values for the pulmonary and coronary arteries were 0.048 and 0.067. The enzyme activity was found to increase markedly with age, the coefficient of correlation between age and 5-nucleotidase activity being + 0.48 ($t = 5.35$) for the aorta and + 0.49 ($t = 5.10$) for the pulmonary artery. The mean enzyme values observed for aortic, pulmonary artery, and coronary artery samples from adults were, respectively, 0.179, 0.104, and 0.110.

The mean 5-nucleotidase activity of arteriosclerotic tissue portions of the aortic samples was moderately lower than the activity of the normal tissue when expressed on the basis of wet tissue weight, but no significant difference was found when the activities were calculated on the basis of the tissue nitrogen content. The average enzyme activities of arteriosclerotic and normal tissue sections of the coronary artery showed no significant difference.

REFERENCES

1. Ahmed, Z., and Reis, J. L.: The Activation and Inhibition of 5-Nucleotidase. *Biochem. J., 69:* 386-387, 1958.
2. Antonini, F. M., and Weber, G.: Fosfatasi specifiche (5-nucleotidasi, ATP-pirofosfatasi) e fosfatasi aspecifica nella parete arteriosa normale, nell'arteriosclerosi umana, nell'arteriopatia sperimentale adrenalinica. *Arch. "De Vecchi," 16:* 985-1012, 1951.
3. Kirk, J. E.: The Adenylpyrophosphatase, Inorganic Pyrophosphatase, and Phosphomonoesterase Activities of Human Arterial Tissue in Individuals of Various Ages. *J. Gerontol., 14:* 181-188, 1959.
4. Naidoo, D., and Pratt, O. E.: The Development of Adenosine 5-Phosphatase Activity with the Maturation of the Rat Cerebral Cortex. *Enzymologia, 16:* 298-304, 1953.
5. Newman, W., Feigin, I., Wolf, A., and Kabat, E. A.: Histochemical Studies on Tissue Enzymes. IV. Distribution of Some Enzyme Systems Which Liberate Phosphate at pH 9.2 as Determined with Various Substrates and Inhibitors; Demonstration of Three Groups of Enzymes. *Am. J. Path., 26:* 257-305, 1950.
6. Reis, J. L.: Studies on 5-Nucleotidase and Its Distribution in Human Tissues. *Biochem. J., 46:* XXI-XXII, 1950.
7. Reis, J. L.: The Specificity of Phosphomonoesterase in Human Tissues. *Biochem. J., 48:* 548-551, 1951.

A STUDY OF SERUM ALKALINE PHOSPHATASE LEVELS IN OLD PEOPLE LIVING AT HOME

W. HOBSON, M.D., AND ARTHUR JORDAN, M.B.
(From the University of Sheffield and the United Sheffield Hospitals, Sheffield, England)

The few studies of the chemistry of the blood in relation to old age have been carried out, for the most part, on elderly persons living under somewhat special conditions in hospitals or in institutions. The study of old people living in their own homes should provide better standards against which to judge deviations possibly due to disease.

The serum alkaline phosphatase activity in old age has been little studied. Vermehren (8) studied 6 women aged 72 to 86 years and found significantly higher values than in the age-range 40 to 55 years. Robertson (7) compared the activity in 14 old people, aged 60 to 78 years, with that found in 60 people aged 20 to 40 years and reported that the older group tended to have higher values and that the difference was possibly significant ($P > 0.05$) but re-examination of his results expressed in logarithms using Student's "t" test leads to the conclusion that there is a significant difference between his younger and older groups ($0.02 < P < 0.05$). Buch (1) gave values for the alkaline phosphatase activity of the serum in old people significantly higher than those he found in young adults; he found no sex difference. Clark, Beck, and Shock (2) demonstrated a significant rise from the sixth decade onwards.

A comprehensive medical survey of old persons living alone or with spouse in Sheffield, England, enabled us to carry out a study of the relationship of the serum alkaline phosphatase activity to age.

METHODS

The group included in the study comprised 70 men between the ages of 67 and 83 years and 92 women between the ages of 61 and 84 years. The method of selecting the subject has already been described (3).

During the medical examination of the patients in their own homes, blood was taken from the cubital vein; cooling of the exposed arm was avoided. The blood was allowed to clot in a dry tube and the serum taken off.

The serum alkaline phosphatase was determined by the method described by King (4) and reported in King units.*

RESULTS AND DISCUSSION

The results of the determinations of the serum alkaline phosphatase activities in relation to age are shown in figure 1. A logarithmic scale has been used for plotting the phosphatase activity. The results from 9 subjects (6 men, 3 women), in whom Paget's disease of bone (osteitis deformans) was diagnosed, have been excluded.

If scatter diagrams of the results shown in figures 1A and 1B are prepared, the distribution of the phosphatase values is seen to be skew in both sexes. This was confirmed by calculation of Fisher's "g_1." The values conform to a log-normal distribution. All subsequent calculations were carried out using the logarithms of phosphatase activities.

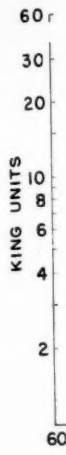
That the distribution of the serum alkaline phosphatase activity is lognormal had already been reported (9), and examination of other results (2, 7) shows that they are not normally distributed.

No significant difference was found between the results for the two sexes.

There was a significant correlation between age and serum alkaline phosphatase activity in the 89 women ($r = +0.2579$, $0.01 < P < 0.02$), but the correlation ceased to be significant if the values for the women aged 61 to 64 were excluded. For the 64 men there was no significant correlation ($r = -0.0644$, $P > 0.05$).

Submitted for publication September 5, 1958.
We wish to thank Dr. J. L. A. Grout for radiological examinations; Mr. D. A. Podmore for help in determining the serum alkaline phosphatase activities; and Mr. A. S. Foster, Miss P. M. Ashton, Mrs. A. A. Bates, and Miss H. E. Curtis for technical and clerical assistance. We should like to thank those general practitioners and old people of Sheffield who by their cooperation made this investigation possible; and the Nuffield Foundation for the generous grant which paid for the expenses of this investigation.

* The alkaline phosphatase activity of a serum expressed in the original King-Armstrong units (5) is equal to the number of milligrams of phenol which would be liberated from the substrate by 100 ml. serum after 30 minutes' incubation at pH 9 with a veronal buffer under the prescribed conditions. The unit used in the present work differs only in employing an incubation period of 15 min., a pH of 10, and a carbonate-bicarbonate buffer. It was introduced by King (6) and it would seem appropriate to call it the King unit. The alkaline phosphatase activities of a given serum expressed in either unit are very similar, but the units are not identical and both are in use; to give them the same name, as is sometimes done, is misleading.



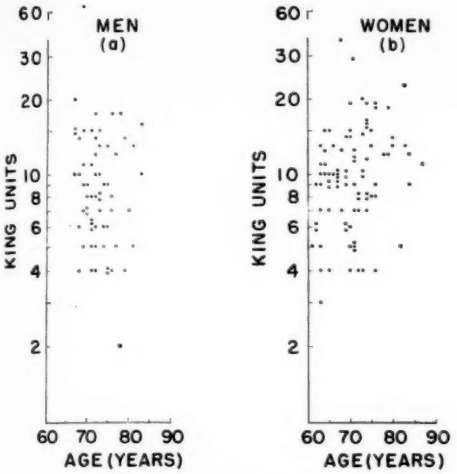


Fig. 1. The relation between age and the serum alkaline phosphatase activity in elderly men and elderly women. The scale of the ordinate (serum alkaline phosphatase activity) is logarithmic and is not continuous between 30 and 60 units.

Combining the results for men and women, it can be said that above the age of 60 the serum alkaline phosphatase activity is in the range of 5 to 16 King units in the middle 80% of normal people.

The men provide a continuous series of values from 2 to 17 units, followed by single results of 20 and 63 units. The women show a continuous series from 3 to 20 points, followed by single results of 22, 27, and 35 units.

The man with a serum alkaline phosphatase activity of 63 units was aged 68 years. He had dental sepsis and some osteoarthritis, but was otherwise clinically normal; an X-ray examination showed no evidence of Paget's disease. One woman had a serum alkaline phosphatase level of 35 units. She suffered from backache; clinical examination revealed nothing abnormal, and the X-ray findings were negative. Whether results as high as 35 or 63 units may be due to undetected disease, such as early Paget's disease, it is impossible to say.

The serum alkaline phosphatase results of the present series were not compared with controls drawn from younger adults. The range of results from the present series extends to higher values than are accepted as normal for younger adults. Wootton and associates (9), using the same technical method as the one used in the present series, found the middle 80% of normal adults aged 18 to 50 to have values lying between 4.5 and 9.5 units. The present series for old people has a higher value for both upper and lower limits.

SUMMARY

The serum alkaline phosphatase activity was determined in 70 men aged 67 to 83 years and 92 women aged 61 to 84 years. The range which encloses the middle 80% of normal old people is 5 to 16 King units. This is higher than in younger age groups. The distribution is lognormal.

REFERENCES

1. Buch, H.: *Serumfosfatase-, serumcitronsyre-og Takata-Ara bestemmelser ved lever-og galdevejssygdomme.* Ejnar Munksgaards Forlag, Copenhagen, 1942.
2. Clark, Jr., L. C., Beck, E. I., and Shock, N. W.: Serum Alkaline Phosphatase in Middle and Old Age. *J. Gerontol., 6:* 7-12, 1951.
3. Hobson, W., and Pemberton, J.: *The Health of the Elderly at Home.* Butterworth, London, 1955.
4. King, E. J.: *Microanalysis in Medical Biochemistry.* 2nd edition. Churchill, London, 1951.
5. King, E. J., and Armstrong, A. R.: Convenient Method for Determining Serum and Bile Phosphatase Activity. *Canad. M.A.J., 31:* 376-381, 1934.
6. King, E. J., Haslewood, G. A. D., and Delory, G. E.: Micro-chemical Methods of Blood Analysis. *Lancet, i:* 886-892, 1937.
7. Robertson, J. D.: Calcium and Phosphorus Studies in Normal People. *Lancet, ii:* 97-100, 1941.
8. Vermehren, E.: Variationen im Phophatasegehalt des Plasmas im Anschluss an die verschiedenen Lebensalter. *Acta Med. Scandinav., 100:* 244-253, 1939.
9. Wootton, I. D. P., King, E. J., and Smith, J. M.: Normal Values and Use of Biochemical Determinations for Diagnosis and Prognosis. *Brit. M. Bull. 7:* 307-311, 1951.

ORAL COMPLAINTS AND TASTE PERCEPTION IN THE AGED

THEODORE COHEN, M.D., AND LEO GITMAN, M.D.
(From the Brooklyn Hebrew Home and Hospital for the Aged, Brooklyn 12)

In a previous study (9) in which we evaluated the gastrointestinal tract in a group of 102 aged individuals, more than one-third complained of some aberration of taste. The present investigation was, therefore, formulated to explore the possibility that the ability to perceive specific tastes was impaired with age and was related to the complaints referable to taste.

Age-related changes occurring in the mouth might theoretically constitute important factors in the problem. A gradual diminution in the number of taste buds with increasing age has been described (11, 20). This change begins at age 40-45 in females and 50-60 in males (1). It has been reported that as many as two-thirds of the taste buds become atrophic in old age (17). The lips and oral mucosa become atrophic, and there is a loss of elasticity and a decrease in the tunica propria. The muscle tone and papillary coating of the tongue are decreased (6). There is also symmetrical bilateral asymptomatic submaxillary gland enlargement (18).

Significant physiological changes also occur. There is a decrease in the flow of saliva with a reduction in the ptyalin content. The pH of the saliva tends to become neutral, and slight alkalinity, especially in the edentulous patient, is not infrequent. The mucous glands secrete a thick ropy saliva which has a high mucin content (6).

METHOD AND MATERIAL

The control subjects selected (table 1) consisted of 100 non-institutionalized individuals under the age of 65 who were divided into two groups: Group I was composed of 45 individuals (27 females, 18 males) between the ages of 18 and 39, and Group II consisted of 55 individuals (25 females, 30 males) between the ages of 40 and 64. Our experimental subjects (Group III) consisted of 248 institutionalized residents whose ages varied between 65 and 94 years (table 1), and their ability to recognize the basic tastes of sour, sweet, salty, and bitter was tested.

Since the purpose of this paper was to correlate taste complaints with gross changes in ability to recognize tastes and not to determine changes in taste thresholds, the concentrations of the substances used were those which were easily identified in preliminary trials in young subjects. The substances and concentrations used were saccharine 0.25%, NaCl 1.0%, quinine sulfate 0.14%, and acetic acid 5%. In using the latter, we realized that its odor might affect the results. However, because of its great penetrability of tissues (2) and because we had a control group for comparison, we believed that we could accurately evaluate our findings.

Prior to testing, each subject was questioned regarding any complaints referable to taste. The presence or absence of teeth was recorded in 151 subjects in Group III.

In order to avoid the effect of appetite on taste perceptibility, all tests were performed midway between meals. Solutions were used at room temperature. Dentures, if present, were removed. The patient's mouth was rinsed with tap water before and after each test. A cotton swab, chosen at random, was saturated with the test solution and wiped across the dorsal, posterior, and lateral surfaces of the tongue. The patient was permitted to withdraw the tongue into the mouth and was immediately asked whether the solution tasted sweet, sour, salty, or bitter. If there was any hesitancy or the patient could not recognize the flavor, the same solution was reapplied two more times, alternating with another flavor and the usual rinsing. If two out of three responses were incorrect, this was regarded as an error.

RESULTS

None of the patients in the control groups had complaints referable to taste. This is in marked contrast to the 33.1% incidence in the individuals over the age of 65 years (table 2). Within the latter group, no definite age-incidence correlation was found. Although females seem to complain more frequently than do males, when these data are age corrected, the

Submitted for publication February 16, 1959.

Presented in part before the Eleventh Annual Meeting of the Gerontological Society, Inc., November 6, 1958, Philadelphia, Pa.

The authors wish to express their appreciation to Mr. Howard Kalb, B.B.A., M.S., for his aid in the preparation of the data.

TABLE 1. AGE DISTRIBUTION OF PATIENTS.

Age	Female	Male	Total
Group I			
Under 20	3	1	4
20 - 29	10	7	17
30 - 39	14	10	24
Total	27	18	45
Group II			
40 - 49	11	10	21
50 - 59	10	11	21
60 - 64	5	8	13
Total	26	29	55
Group III			
65 - 69	18	8	26
70 - 74	31	33	64
75 - 79	50	30	80
80 - 84	23	22	45
85 - 89	18	10	28
90 - 94	4	1	5
Total	144	104	248

TABLE 2. INCIDENCE OF COMPLAINTS RELATED TO AGE AND SEX IN GROUP III.

Age	Female		Male	
	Total Number	% with Complaints	Total Number	% with Complaints
65 - 69	18	38.9	8	25.0
70 - 74	31	38.7	33	18.2
75 - 79	50	36.0	30	33.3
80 - 84	23	52.2	22	22.7
85 - 89	18	16.7	10	30.0
90 - 94	4	75.0	1	0
Total	144	38.9	104	25.8

Total incidence of complaints—33.1%.

TABLE 3. SPECIFIC COMPLAINTS ACCORDING TO SEX IN GROUP III.

Complaint	Female	Male	Total
Bitter	28	7	35
Sour	18	9	27
Dry	11	8	19
"Peculiar"	7	2	9
Salty	2	2	4
No Taste	2	2	4
Total	68	30	98

TABLE 4. RELATION OF TEST ERRORS TO AGE AND SEX.

	Group I	Group II	Group III
Sex	(45)	(55)	(248)
Female	22.2%	3.4%	20.1%
	(18)	(29)	(144)
Male	18.5%	26.9%	35.6%
	(27)	(26)	(104)
Total	20%	14.5%	26.6%
	(45)	(55)	(248)

( )=Total number of patients in group tested.

TABLE 5. PERCENTAGE INCIDENCE OF INCORRECT RESPONSES TO SPECIFIC TESTS.

	Group I	Group II	Group III
Test	(45)	(55)	(248)
Sour	11.1	9.1	16.5
Salty	2.2	7.3	8.1
Bitter	8.9	1.8	4.4
Sweet	2.2	0	2.0

( )=Total number of patients in group tested.

difference disappears completely, yielding a P value of 0.25.

The complaints most frequently presented were: sour, bitter, and dry (table 3). The total number of complaints elicited were 98, indicating that some patients had two and even three complaints.

The incidence of test errors in patients under 65 was 17% (table 4). The 10% increase of test errors in the group over 65 years was statistically not significant ($P = 0.07$) (table 4). This implies that there is no alteration of gross taste perception with age.

A comparison of the specific tests shows sour to be the taste most frequently missed. Bitter and salty were mistaken with similar frequency, and sweet was most readily recognizable (table 5). Single test errors were the rule in all age groups, multiple test errors per subject being the exception (table 6).

The incidence of test errors seems to be sex-related (table 7). The males made more mistakes than the female ($P = 0.01$).

It is evident from the summarized data (table 8 that complaints referable to taste bear no relation to taste perception. The group presenting complaints showed a 26.8% incidence of taste errors compared to 26.5 in the group with no complaints.

Analysis of the responses of edentulous patients with dentures reveals no significant difference from those with single or no dentures (table 9).

TABLE 6. PERCENTAGE DISTRIBUTION OF TASTE ERRORS.

	Group I	Group II	Group III
Errors	(45)	(55)	(248)
Missed 1 Test	20	9.1	22.6
Missed 2 Tests	0	3.6	3.6
Missed 3 Tests	2.2	0	0.4

( )=Total number of patients in group tested.

TABLE 7. INCIDENCE OF TEST ERRORS RELATED TO AGE AND SEX IN GROUP III.

	Number of Patients Tested	% of Incorrect Responses	Number of Patients Tested	% of Incorrect Responses
Age	Female		Male	
65-69	18	11.1	8	25.0
70-74	31	12.9	33	39.4
75-79	50	22.0	30	40.0
80-84	23	30.4	22	31.8
85-89	18	27.8	10	20.0
90-94	4	0	1	100
Total	144	20.1	104	35.6

TABLE 8. RELATIONSHIP BETWEEN COMPLAINTS AND TEST ERRORS.

Complaints vs. No Complaints	Group I (45)	Group II (55)	Group III (248)
Complaints			
Number of Patients	0	0	82
% of Incorrect Responses	0	0	26.8
No Complaints			
Number of Patients	45	55	166
% of Incorrect Responses	20	14.5	26.5

( )=Total number of patients in group tested.

TABLE 9. RELATIONSHIP BETWEEN DENTAL STATUS AND TEST ERRORS OR COMPLAINTS IN GROUP III.

	Teeth and Dentures (32)	Dentures Only (103)	Teeth Only (16)
% With Complaints	25.9	30.1	25.0
% Incorrect Responses	25.9	24.2	38.5

( )= Total number of patients in group tested.

DISCUSSION

Taste is a very complex modality which is subject to the influence of numerous internal and external factors. One of the most important is odor. It would be very difficult, for instance, to distinguish between an apple and an onion if one had to depend upon taste alone for recognition (21). Temperature plays an important role in gustatory response; the body temperature being most conducive to maximal sensitivity (24). Gustatory acuity is related to satiety, showing an increase before food ingestion and decrease in the post-prandial period (14). Appetite also tends to be better when an individual is healthy, so that the state of health is another contributory factor.

A substance repeatedly placed on one spot on the tongue evokes decreasing responses (21). This is believed to be due to physiological fatigue, which may be related to either the local epithelial mechanism or the nerve supplying the taste bud.

It has been stated that taste perception becomes more acute with decreased atmospheric pressure (15). Touch (8), pain (16), genotype (3), and the body's need for a particular substance (23) have been designated factors influencing taste. The influence of tobacco is as yet a moot question (10, 21). Blood levels of various substances provide stimulation to taste as evidenced by the bitter taste in the mouth following the intravenous administration of decholin.

At present it is felt that taste receptors are functionally distinct although more than one kind may be present in a single papilla. They are arranged in a different distribution on the tongue, so that the tip is most sensitive to sweet and salty, the lateral portions to sour, and the posterior portion to bitter (2).

The chemical stimuli for specific tastes are predominantly organic compounds, such as sugars and alkaloids for sweet and bitter respectively, inorganic compounds, notably the chloride ion for salty, and the hydrogen ion for sour (2).

Engstrom and Rytzner (12) believe that the presence of a rich nerve supply in the region around the taste bud supports the contention that the epithelial region nearest the taste bud may be of importance in the production of taste. Bourne (5) has demonstrated the presence of alkaline phosphatase in the superficial layers of the epithelium overlaying the taste buds in humans. He and El-Baradi (11) were of the opinion that taste may be associated with the inhibition of this enzyme. They further showed the presence of a simple esterase which histochemically is inhibited by quinine but not by salt or sugar.

There is a paucity of published data dealing with taste perception in the aged. Bourlière (4) recently found an increase in the threshold of perception and recognition of sweet in old age which is independent of sex. However, when he tested the response to salty solutions, he noted a slight rise in threshold for perception and a more marked one in threshold recognition in older individuals, particularly males.

Richter and Campbell (22) also think that there is an elevated threshold for sweet in older individuals. Fox (13), in testing several thiocarbamide compounds, found that the ability to recognize them did not change with age, whereas Harris and Kalmus (16) noted a decreased ability with age in testing patients with phenylthiourea.

More recently, Byrd (7), utilizing weak (but not threshold), medium and strong solutions of the 4 basic flavors in various age groups, concluded that there was an insignificant difference between the responses of the young and the aged subjects. A search of the available literature has failed to reveal any studies correlating taste perception and complaints.

Our study indicates that there is an insignificant difference between the older and the

younger person's ability to discern the basic tastes and that males have more difficulty recognizing basic tastes than do females. The absence of age-correlated differences in taste perception is in marked contrast to the greatly increased number of complaints in the aged.

The reason for this increase of complaints is not clearly understood, but a number of possible explanations present themselves. Many old people, with their loss of interest in their surroundings and the people around them and their decreased activity, tend to be introspective and concentrate on somatic complaints. It is well known that the physical appearance of food and its preparation affect one's response to taste. Although the variety of food served in this Institution is similar to that which our patients had eaten in the past, of necessity institutional food is not prepared precisely in the manner to which many patients may have been accustomed throughout 30 or 40 years of married life. A dislike of the food eaten could possibly be expressed as a bad taste in the mouth.

Landa (19) states that age is a very potent factor in the deterioration of taste sensation and that older people undergo changes in their preference for specific tastes, particularly a loss of desire for sweet. (It is interesting to note that sweet was the flavor least frequently missed by our aged subjects). He also believes that the aged foreign-born individuals who reminisce about the more tasty food eaten in youth are not aware that they are comparing the pleasant memories of taste and smell of their vigorous youth with the experience of impaired sense in old age. Perhaps, in this part of life span, an individual is subconsciously expressing a general "distaste" for life. Whatever the modus operandi, there most assuredly will be numerous psychiatric as well as organic components.

SUMMARY AND CONCLUSIONS

Complaints referable to taste perception are far more frequent in the aged than in the younger individual and bear no relation to the person's ability to recognize the basic tastes.

There is no significant decrement in gross taste perception with aging.

Males show a statistically significant higher incidence of taste error than do females.

The highest incidence of errors occurs in testing for sour. The percentage of error for any specific taste is similar for all ages. Multiple errors by a single individual occur in comparatively few instances.

No correlation is found between the use of dentures and the incidence of complaints or test errors.

REFERENCES

1. Allara, E.: Ricerche sull' organo del Gusto dell' Uomo. 1. La Struttura della Papille Gustative nelle varie Età della Vita. *Arch. ital. anat. e embriol., 42:* 406-564, 1939.
2. Best, C. H., and Taylor, N. B.: The Chemical Senses. In: *The Physiological Basis of Medical Practice.* 6th ed. Williams & Wilkins, Baltimore, 1955, pp. 1213-1224.
3. Blakeslee, A. F.: Genetics of Sensory Thresholds: Taste for Phenylthiocarbamide. *Proc. Nat. Acad. Sci., 18:* 120-130, 1932.
4. Bourlière, F., Cendron, H., and Rappaport, A.: Modification avec l'Age des Seuils Gustatifs de Perception et de Reconnaissance aux Saveurs Salés et Sucrés, chez l'Homme. *Gerontologia, 2:* 105-112, 1958.
5. Bourne, G. H.: Alkaline Phosphatase in Taste Buds and Nasal Mucosa. *Nature, 161:* 445-446, 1948.
6. Burket, L. W.: Oral Pediatrics and Geriodontics. In: *Oral Medicine, Diagnosis & Treatment.* 2nd ed. J. P. Lippincott, Philadelphia, 1952, pp. 429-446.
7. Byrd, E.: Taste Sensitivity In Aging (Abstract). *J. Gerontol., 13:* 435, 1958.
8. Clark, E. C., and Dodge, H. W.: The Appreciation of Flavors. *Post-grad. Med., 17:* 142-144, 1955.
9. Cohen, T., and Gitman, L.: Studies of the Gastro-Intestinal Tract In the Aged (Abstract). *J. Gerontol., 13:* 441, 1958.
10. Cox, G. J., and Nathans, J. W.: Subthreshold Taste of Dilute Salt Solutions with Special Reference to Sodium Fluoride. *J. Appl. Physiol., 5:* 395-398, 1953.
11. El-Baradi, A. F., and Bourne, G. H.: Theory of Tastes and Odors. *Science, 113:* 660-661, 1951.
12. Engstrom, H., and Rytzner, C.: The Structure of Taste Buds and Fibers. *Ann. Otol. Rhin. & Laryng., 65:* 361-375, 1956.
13. Fox, A. L.: Relationship Between Chemical Constitution and Taste. *Proc. Nat. Acad. Sci., 18:* 115-120, 1932.
14. Goetzel, F. R., Anokas, A. J., and Payne, J. G.: Occurrence In Normal Individuals of Diurnal Variations in Acuity of Sense of Taste for Sucrose. *J. Appl. Physiol., 2:* 619-626, 1950.
15. Grandjean, E., and Fleisch, A.: Neues Aesthesiometer vergleichender Messungen der Reizschwellen des Druck- und Geschmackssinnes in Lauterbrunnen und auf Jungfraujoch. *Helvet. Physiol. et Pharmacol. Acta, 1:* c59-60, 1943.

16. Harris, H., and Kalmus, H.: The Measurement of Taste Sensitivity to Phenylthiourea. *Ann. Eugenics., 19:* 24-31, 1949.

17. Harris, W.: Fifth and Seventh Cranial Nerves in Relation to the Nervous Mechanism of Taste Sensation: A New Approach, *Brit. J. Med., 1:* 831-836, 1952.

18. Keleman, G., and Montgomery, W. W.: Symmetrical, Asymptomatic Sub-Maxillary Gland Enlargement in Older Age Groups. *New England J. Med., 258:* 188-189, 1958.

19. Landa, J. S.: Psychic and Physiologic Phenomena Relating to Taste Sensations. In: *The Dynamics of Psychosomatic Dentistry.* Dental Items of Interest Publishing Co., Brooklyn, 1953. pp. 233-237.

20. Mochizuki, Y.: Papilla Foliata of Japanese. *Folia anat. jap., 18:* 337-369, 1939.

21. Montkrieff, R. W.: Gustation. In: *The Chemical Senses.* 2nd ed. Leonard Hill Publ. Co., London, 1951, pp. 131-171.

22. Richter, C. P., and Campbell, K. H.: Sucrose Taste Threshold of Rats and Humans. *Am. J. Physiol., 128:* 291-297, 1940.

23. Richter, C. P.: Salt Taste Thresholds of Normal and Adrenalectomized Rats. *Endrocrinology, 24:* 367-371, 1939.

24. Weber, E.: Über den Einfluss der Ewärmung und Erkaltung der Nerven auf ihr Leitungsvermögen. *Arch. Anat. u. Physiol.:* 342-356, 1847.

OUTLINE OF GERONTOLOGY IN JAPAN AND SOME ASPECTS OF LIFE SPAN AND CAUSES OF DEATH IN THE JAPANESE

SADAMU WATANABE, M.D.
(Chairman, Gerontological Association of Japan, 2-1325 Soshigaya Setagay-ku, Tokyo)

OUTLINE OF THE PRESENT STATUS OF GERONTOLOGY IN JAPAN

Gerontology in Japan, generally speaking, at present is in the initial stage, although public concern is rapidly increasing. To describe the background of its development, the following factors should be taken into consideration:

First, there is a high level of mortality of the Japanese (table 1), in spite of the remarkable decrease in the death rate after the war. Second, a sharp increase in the number of aged people and a rapid aging of the population is anticipated in the near future. For instance, the number of the aged 65 years and over will be as many as 18 million in 2015, and they will constitute about 21% of the whole population (table 2). This is very serious, considering the rather poor natural resources and the small area of our territories. The third factor is the deplorable social conditions. Formerly old people lived in the traditional family system in Japan, but now the previous family system has been changed. Moreover, the living conditions of the aged have deteriorated, largely because of devaluation of their savings. In the current ways of thinking, respect for the aged has diminished. In spite of such an unfavorable situation for the aged, little has been done to ameliorate it, although awareness of the problems of the aged stimulated the establishment of the Gerontological Association of Japan in 1954, and the first Gerontological Congress was held in 1956 under the auspices of our Association.

The present status and activities of the several fields of gerontology may be summarized as follows:

In biology, research concerning aging is still scarce. With respect to geriatrics, the first book on the subject in Japan was published as early as 1920 by Irisawa (5). Since then progress has been included in that of general medicine.

Recently interest in research in clinical geriatrics became intensified, partly due to the recent popularity of short-term health examinations of the aged through screening tests, but fundamental research in aging, in general, is still lacking. General interest in the sociological, economic, and psychological aspects of this problem is rapidly increasing, although the number of people involved is still very limited.

Demography and vital statistics are making a contribution. For instance, vital statistics after the war are supplying information on deaths by age and the main causes of death even as promptly as three months after the occurrence of death. Finally, with increasing public concern, several social activities for the aged are being planned, mainly in large cities, but they are rather limited in scale. Although the national pensions for the aged cover only 30% of all those who are engaged in some work at present, plans for expansion are being made by government and civil enterprises as well. No special governmental agency for the affairs of the aged has been established as yet.

TRENDS IN MORTALITY BY CAUSES OF DEATH IN JAPAN

Although the crude death rate in Japan sharply decreased and the expectation of life at birth considerably increased after the war (tables 3 and 4), death rates by age group in Japan are noticeably higher than those of other countries. Figure 1 compares the estimated average length of life at birth in Japan and the U. S. A.

Expectation of life for Japanese (1, 14, 15) at birth in the pre-war period was very short, 46.9 years for males and 49.6 for females, despite the fact that the Japanese were living in a fairly moderate climate and that medicine had presumably reached the world level. At that time, I questioned whether the short life of the Japanese was caused by the fact of being born weak or the generally unfavorable living conditions. After World War II, I feared that the mortality of the Japanese people would rise markedly, due to the highly discouraging living conditions, but the result was to the contrary.

Submitted for publication September 23, 1958.
Presented at the Eleventh Annual Meeting of the Gerontological Society, Inc., November 7, 1958, Philadelphia, Pa.
Published on a grant (H-3939) from the National Institutes of Health, which also, in part, made possible Dr. Watanabe's participation in the above-mentioned meetings.

TABLE 1. DEATH RATES BY AGE AND SEX OF VARIOUS COUNTRIES IN PERCENTAGE OF 1953 JAPANESE DEATH RATES.

Age	1953	Japan	U. S. A.	Britain	France	Netherlands	Norway
Males							
0	52.9	100	67	58	93	48	48
1 - 4	5.8	100	24	22	36	30	27
5 - 9	1.7	100	39	34	37	54	50
10 - 14	0.8	100	82	55	64	83	67
15 - 19	1.6	100	90	52	66	58	63
20 - 24	2.9	100	72	41	54	38	44
25 - 29	3.1	100	61	40	58	36	42
30 - 34	3.3	100	67	45	69	40	48
35 - 39	3.9	100	82	53	81	45	45
40 - 44	5.1	100	98	60	94	52	55
45 - 49	7.7	100	105	73	103	54	57
50 - 54	11.8	100	109	87	105	58	56
55 - 59	18.7	100	104	92	99	60	55
60 - 64	29.4	100	99	96	91	60	56
65 - 69	47.9	100	89	92	86	58	55
70 - 74	77.7	100	75	86	82	62	56
75 -	145.8	100	81	95	100	78	73
Females							
0	46.2	100	59	52	80	41	42
1 - 4	5.7	100	21	19	31	27	18
5 - 9	1.5	100	31	28	33	43	23
10 - 14	0.7	100	55	49	51	61	44
15 - 19	1.3	100	52	35	45	40	38
20 - 24	2.3	100	35	29	39	26	21
25 - 29	2.8	100	37	33	43	26	23
30 - 34	3.1	100	45	39	52	38	35
35 - 39	3.5	100	59	47	65	45	36
40 - 44	4.4	100	72	58	70	51	40
45 - 49	6.0	100	79	64	75	57	48
50 - 54	8.6	100	85	67	78	62	51
55 - 59	12.8	100	82	70	76	64	57
60 - 64	19.7	100	82	74	75	68	55
65 - 69	32.9	100	80	74	73	71	59
70 - 74	6[illegible].7	100	71	75	75	75	62
75 -	118.0	100	85	93	96	92	86

The principal reasons for the improvement in life expectancy in Japan after the war, of course, include the discovery of epoch-making remedies and the progress of medicine. In addition, rapid post-war progress of public health, which had been retarded except in communicable disease control, over-all spread of health insurance, and a great social change, which is intended to thoroughly democratize this country, came to realization almost simultaneously.

Moreover, the influence of racial susceptibility to tuberculosis, the disease which used to occupy the first position in the national mortality, might be taken into consideration. The incidence of tuberculosis and other infectious diseases seemed to decrease since 1940. As a result of this, in 1956 the death rate from tuberculosis declined by 74%, pneumonia by 72%, gastroenteritis by 77%, nephritis by 80%, typhoid fever by 63%, compared with the corresponding rates in 1947.

On the other hand, an increase in mortality was observed in several diseases: vascular lesions affecting the central nervous system (hereafter quoted as CVA) by 15% (fig. 2), cancer by 33%, heart disease by 6%, cirrhosis of the liver by 35%; mortality due to suicide increased by 56%.

Here arises the question as to whether the death rate could be decreased still more and the life span further extended. To answer this, trends in death rate by age should first be ob-

TABLE 2. FUTURE POPULATION OF JAPAN (IN THOUSANDS).

Year	Total Population	0 — 14	15 — 64	65 — 74	75 —
1955*	89,275 (100.0)%	29,992 (33.6)%	54,558 (61.1)%	3,339 (3.7)%	1,385 (1.6)%
1965	96,398 (100.0)	22,925 (23.8)	67,363 (70.0)	4,257 (4.4)	1,853 (1.9)
1975	102,729 (100.0)	20,626 (20.3)	74,254 (72.3)	5,506 (5.4)	2,344 (2.3)
1985	104,864 (100.0)	19,136 (18.2)	76,232 (72.7)	6,494 (6.2)	3,002 (2.9)
1995	103,092 (100.0)	15,425 (15.0)	75,372 (73.1)	8,707 (8.4)	3,589 (3.5)
2005	98,533 (100.0)	14,719 (15.0)	68,572 (69.6)	10,441 (10.6)	4,801 (4.9)
2015	89,861 (100.0)	12,265 (13.7)	59,036 (65.7)	12,831 (14.3)	5,728 (6.4)

Prepared by the Institute of Population Problems, Welfare Ministry.
For 1955—1965, population prediction.
For 1965—2015, population project based upon the hypothetical differential fertility rate and mortality rate for 1965.
* 1955 Quinquennial Census of Japan.

TABLE 3. CHANGES OF CRUDE DEATH RATES IN JAPAN.

Year	Deaths per Thousand	
	Males	Females
1935	17.4	16.2
1947	15.6	13.6
1950	11.4	10.3
1955	8.3	7.2
1956	8.6	7.5
1957	8.9	7.7

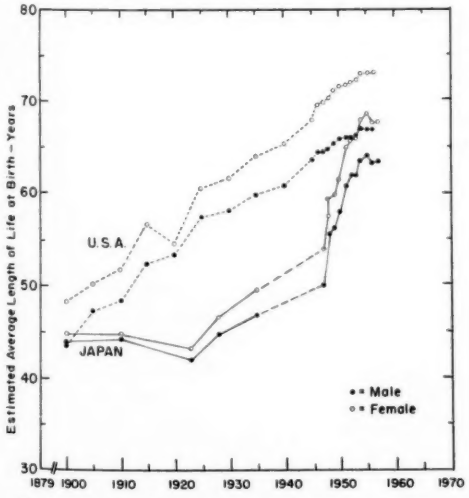


Fig. 1. Estimated average length of life at birth in Japan and the U.S.A. from 1879 to 1957.

served, and then successively the leading selected causes of death studied, using analytical knowledge on the important causes of death by age groups. Table 5 shows death rates by age. It is readily seen from this table that the degree of decline in the death rate is slowing down and that the death rate is even increasing in the groups of advanced age.

National statistics by causes of death reveal that between 40 and 50 years of age tuberculosis or cancer is the leading cause of death in males and cancer in females. Between 50 and 65, CVA, cancer, and heart disease follow, in that order, constituting more than 50% of deaths by all causes. Since CVA rank first in Japan in the 50-65 age group, it might be questioned whether the Japanese are a "hypertensive" nation. As shown in table 6, however, average blood pressure by age group is almost the same in Japan as it is the United States of America (9, 11, 16). In the United States, however, as shown in table 7, heart disease ranks the highest among the causes of death.

The mean value of serum cholesterol of the Japanese is 160 to 170 mg./100 ml. for males and 175 to 195 mg./100 ml. for females, according to Fukuda's studies (2, 3) on 1419 subjects in a population of farmers and fishermen, being definitely lower than that seen in the United States, according to the survey of Keys (7). This hypocholesterolemia in the Japanese might be related to the low incidence of CVA, especially in the rural districts. The relation of serum cholesterol to CVA is being investigated by some workers. Among other suspected causes of the prevalence of CVA in Japanese are excessive intake of rice or salt, overwork, drinking Japanese wine (sake), or their various combinations.

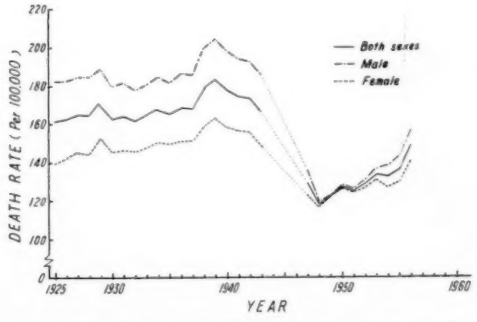


Fig. 2. Death rate per 100,000 from cerebral vascular accidents in Japan from 1925 to 1957.

TABLE 4. CHANGES IN EXPECTATION OF LIFE AT BIRTH IN JAPAN.

Life Table	Period	Males		Females	
		Japan	U.S.A.	Japan	U.S.A.
5th Life Table	1926-1930	44.8	55.6 (1928)	46.5	58.3 (1928)
6th Life Table	1935-1936	46.9	59.9 (1935)	49.6	63.9 (1935)
Abridged Life Table	1947	50.1	64.4	54.0	69.7
Abridged Life Table	1950	58.0	65.7	61.5	71.3
Abridged Life Table	1955	63.9	66.7	68.4	72.9
Abridged Life Table	1956	63.1	66.7	67.5	73.0
Abridged Life Table	1957	63.2	—	67.6	—

TABLE 5. TRENDS OF INDICES OF DEATH RATE BY AGE IN JAPANESE.

Males

Age	1935	1947	1954	1955	1956	1957	Death Rate per 1,000 in 1947
20 - 24	112	100	35	33	31	30	8.3
25 - 29	93	100	37	33	31	30	8.6
30 - 34	87	100	40	36	33	33	8.2
35 - 39	88	100	45	40	40	39	8.6
40 - 44	98	100	52	48	47	47	9.7
45 - 49	100	100	61	58	58	59	12.3
50 - 54	113	100	67	64	66	66	17.3
55 - 59	110	100	71	66	69	72	25.6
60 - 64	97	100	68	67	69	72	40.7
65 - 69	102	100	72	72	73	76	61.6
70 - 74	99	100	79	77	83	88	90.2
75 - 79	100	100	78	77	84	90	135.5
80 -	95	100	80	77	85	91	221.8

Females

Age	1935	1947	1954	1955	1956	1957	Death Rate per 1,000 in 1947
20 - 24	126	100	30	27	25	24	7.4
25 - 29	113	100	35	31	29	28	7.3
30 - 34	112	100	41	36	35	34	7.0
35 - 39	117	100	47	42	40	40	7.1
40 - 44	113	100	51	48	46	47	7.8
45 - 49	112	100	61	59	57	57	9.0
50 - 54	109	100	66	62	63	62	12.4
55 - 59	107	100	69	67	68	68	16.9
60 - 64	96	100	67	65	66	68	26.9
65 - 69	102	100	74	72	75	75	40.2
70 - 74	100	100	77	75	81	84	64.1
75 - 79	101	100	76	75	81	85	103.1
80 -	96	100	78	79	87	91	186.2

Recently attention has been focused on the quality of drinking water. Misawa (10) described the high incidence of CVA in northern Japan to the silicate-rich drinking water. Kobayashi (8) concluded from his extensive studies on river and drinking water that the ration of sulfate to carbonate is proportional to the incidence of CVA.

Mortality due to CVA started to decline when food control was enforced by the government during the war, causing malnutrition (thereby the average daily caloric intake for Japanese dropped lower than 2,000), which reached its lowest point in 1948. Mortality from CVA started rising as the national nutrition improved after that time. This tendency of increase in mortality is slightly less pronounced in females. However, although blood pressure returned almost to the prewar level, the incidence of CVA is still definitely lower than before the war (table 8) (4, 6, 13, 17).

As far as cancer is concerned, Japan ranks 21st in males and 22nd in females among 27 countries in 1950, according to Segi (12). Cancer of the stomach constitutes 56% of the cancer cases in males and 40% in females. Japan ranks next to Chile in the incidence of stomach cancer. The death rate from cancer of the stomach shows a steady increase with advancing age, particularly since the war. In cancer of the lung, Japan ranks the lowest in both sexes among 20 countries, although there has been a remarkable increase in recent years.

Among the diseases of the digestive tract, ulcer of the stomach in Japan ranks the highest in the world in males and in females as well. Deaths due to other gastro-intestinal diseases have decreased markedly but still rank high compared with other countries. The possible contribution of excessive rice intake in the prevalence of these diseases deserves further study. The incidence of cirrhosis of the liver is also gradually increasing. Frequency of suicide around 20 years of age and 70 years and over is the highest in the world. but shows a tendency to decrease in the latter age group. The survey of causes of death was based on death certificates.

TABLE 6. AVERAGE SYSTOLIC BLOOD PRESSURE OF THE JAPANESE (15,706 CIVILIANS AND EMPLOYEES IN 16 INDUSTRIAL PLANTS AND ARMY AIRFIELDS) BEFORE AND AFTER THE WAR.

Age	Males			Females		
	Before the War*	1956†	U.S.A.‡	Before the War*	1956†	U.S.A.‡
20 - 24	119 ± 9α	124 ± 16α	123 ± 14α	113 ± 10α	117 ± 15α	116 ± 12α
25 - 29	120 ± 10	123 ± 16	125 ± 13	114 ± 11	118 ± 15	117 ± 11
30 - 34	121 ± 11	122 ± 16	126 ± 14	116 ± 14	118 ± 15	120 ± 14
35 - 39	124 ± 12	123 ± 17	127 ± 14	120 ± 16	121 ± 20	124 ± 14
40 - 44	128 ± 15	126 ± 18	129 ± 15	124 ± 19	123 ± 20	127 ± 17
45 - 49	133 ± 18	130 ± 23	130 ± 17	129 ± 21	131 ± 24	131 ± 19
50 - 54	138 ± 21	134 ± 23	134 ± 19	136 ± 24	137 ± 26	137 ± 21
55 - 59	143 ± 24	138 ± 27	138 ± 19	143 ± 28	144 ± 30	139 ± 21
60 and over	—	148 ± 30	141 ± 22	—	149 ± 31	144 ± 22

* Materials—Applicants for life insurance (16).
† National Nutrition Survey in 1956 (11).
‡ Master (9).

TABLE 7. COMPARISON OF THE LEADING CAUSES OF DEATH IN JAPAN AND THE U.S.A.

Age	Mortality per 1,000 from All Causes of Death		First Cause (%)		Second Cause (%)		Third Cause (%)	
	Japan 1955	U.S.A. 1950	Japan 1955	U.S.A. 1950	Japan 1955	U.S.A. 1950	Japan 1955	U.S.A. 1950
Males								
40-44	4.7	5.4	TB 21	H 33	Can. 14	Acc. 15	Acc. 12	Can. 13
45-49	7.2	8.4	Can. 18	H 40	TB 16	Can. 15	CVA 16	Acc. 10
50-54	11.0	13.3	CVA 21	H 45	Can. 20	Can. 16	TB 12	Acc. 7
55-59	17.0	19.6	CVA 25	H 47	Can. 21	Can. 18	H 10	Acc. 7
60-69	34.5	35.2	CVA 29	H 47	Can. 19	Can. 17	H 10	CVA 10
70-79	82.4	74.4	CVA 27	H 47	Sen. 14	Can. 15	Can. 12	CVA 14
Females								
40-44	3.8	3.5	Can. 24	Can. 36	TB 16	H 19	H 10	CVA 7
45-49	5.3	5.1	Can. 26	Can. 36	CVA 18	H 23	TB 12	CVA 9
50-54	7.7	7.7	Can. 26	Can. 35	CVA 24	H 28	H 10	CVA 11
55-59	11.3	10.9	CVA 27	H 33	Can. 24	Can. 32	H 10	CVA 11
60-69	22.7	21.8	CVA 30	H 40	Can. 19	Can. 14	H 11	CVA 14
70-79	59.7	54.3	CVA 28	H 45	Sen. 17	Can. 17	H 10	CVA 16

Acc. = Accidental death
Can. = Malignant neoplasm
CVA = Cardiovascular accident
H = Heart disease
Sen. = Senility
TB = Tuberculosis

SUMMARY

The recently marked increase in the number of the aged in Japan is almost unique in the world. In addition, poor natural resources and changes in the family system in Japan require rapid development of the gerontological sciences.

Efforts should be directed toward the improvement of the still high mortality in infants and children as well as the aged in Japan. Characteristic trends in the causes of death in Japan should be investigated further with close cooperation in the various fields of gerontology.

TABLE 8. TRENDS OF THE AVERAGE SYSTOLIC BLOOD PRESSURE BY SEX AND AGE GROUP IN JAPAN (Mm. H.g.).

Age	Prewar*	1947-1949†	1950-1952†	1956‡
		Males		
35 -	124	120	121	123
40 -	128	123	124	126
45 -	133	125	128	130
50 -	138	129	133	134
55 - 59	143	134	138	138
		Females		
35 -	120	117	117	121
40 -	124	120	121	123
45 -	129	126	125	131
50 -	136	128	132	139
55 - 59	143	133	138	144

* Applicants for insurance, Asahi and Meiji Life Insurance Companies (4, 6).
† Applicants for insurance, Nippon Life Insurance Company (13).
‡ National Nutrition Survey in 1956 (11).

REFERENCES

1. *Bulletin of Welfare and Health Statistics in Japan* (published monthly by the Ministry of Health and Welfare of Japan).
2. Fukuda, T.: Diet and Arteriosclerosis. *Nisshin Igaku* (Modern Medicine), *10:* 78-86, 1956.
3. Fukuda, T.: *Symposium on Aetiology of Hypertension,* General Medical Congress, Tokyo, 1959 (in press).
4. Hiyoshi, J.: *Statistical Study of Blood Pressure of the Japanese. J. Life Ins. Med. Japan, 42:* 107-151, 1943.
5. Irisawa, T.: *Rojinbyōgaku* (Geriatric Medicine). Nankodo Press, Tokyo, 1919.
6. Isshiki, T.: Blood Pressure of the Japanese. *J. Life Ins. Med. Japan, 38:* 1-58, 1939.
7. Keys, A.: Human Atherosclerosis and Diet. *Circulation, 5:* 115-118, 1952.
8. Kobayashi, J.: On the Geographical Relationship Between the Chemical Nature of River Water and Death Rate from Apoplexy. *Ber. Ohara Inst. Landwirtsch. Biol., 11:* 12-21, 1957.
9. Master, A.: *Normal Blood Pressure and Hypertension.* Lea & Febiger, Philadelphia, 1952, pp. 96.
10. Misawa, T.: Influence of Silicate-rich Drinking Water on Organisms. *Nihon Iji Shinpo* (Japanese Medical Weekly Periodical) No. 1718, 3-8, 1957.
11. *Present Status of National Nutrition Survey* (Official Report): Ministry of Health and Welfare of Japan, 1956, pp. 116-117.
12. Segi, M.: Cancer Mortality Statistics in Japan. *Nihon Gakujutsu Shinkō Kai* (The Japanese Society for the Promotion of Science) 1955, p. 40.
13. Suzuki, H.: Trends in the Blood Pressure of the Japanese After War II. *J. Life Ins. Med. Japan,* 52-53: 1-42, 1954.
14. Watanabe, S., and Kawai, S.: *Life Span of the Japanese.* The Association of Life Insurance in Japan, 1940.
15. Watanabe, S.: *Estimation of Life Span and Life Insurance.* Bunkodo Press, Tokyo, 1943.
16. Watanabe, S.: Blood Pressure of the Japanese. *Saishin Igaku* (Modern Medicine), *2-7:* 27-36, 1947.
17. Watanabe, S.: Distribution of Blood Pressure by Age of the Japanese. *Sogo Rinshō* (Joint Clinic), *3-10:* 55-62, 1949.

THE CORNELL MEDICAL INDEX QUESTIONNAIRE AS A MEASURE OF HEALTH IN SOCIO-MEDICAL RESEARCH

CECIL GORDON, Ph.D., A. R. EMERSON, Ph.D.,* AND J. SIMPSON, M.D., D.P.H.†
(From the Department of Public Health and Social Medicine, Usher Institute, University of Edinburgh, Edinburgh, Scotland)

It is frequently necessary to examine the morbidity experience of various groups in research situations in social science. Examples with which we have dealt are the effect of aging on adaptability to work and the adjustment to retirement. In such situations it is important to have a self-rating from the respondent which affords an index not primarily of his health in an absolute sense, but as he perceives it. In this latter sense such a report may prove to be especially useful in assessing the adjustment of defined groups of respondents. Certain measures of health that are meaningful for socio-medical research are already in existence (6, 12). They are calculated from data derived from interviews which elicit information on the recent and more distant past, and afford a comparison between groups by a variety of measures such as working days absent, expressed as a rate during a specified period.

For certain purposes, notably in experimental designs of longitudinal type, an instrument which affords a more powerful kind of measurement than a purely nominal scale is helpful in determining the extent of changes (4). The working assumption is that among older people it is valid to regard (chronic) illness and its complement, health, as a continuum and that it is reasonable to try to establish a standardized questionnaire yielding a score which would be analogous to a scaling procedure. Such an instrument would have much in common with personality inventories. Problems of the validity of personality questionnaires have been reviewed (5) as have those of the scaling of attitudes (10). These problems are seen to be considerable, but a major implication of these two critiques seems to be that, rather than compile further inventories, we should spend more time improving those we have.

Submitted for publication September 12, 1958.
* Present address: Department of Social Science, University of Nottingham.
† Present address: Department of Social and Preventive Medicine, University of Manchester.
This work was assisted by the Human Relations Committee of the Department of Scientific and Industrial Research, the Medical Research Council, the Scottish Region of British Railways (through Mr. C. H. Brazier, Mr. J. Weston, and Mr. D. Murray, and the co-operation of Dr. W. A. R. Mailer and Dr. J. D. Gelletly), and the Trade Unions concerned. We are also indebted to Dr. Katherine Lévy.

In these circumstances the Cornell Medical Index (C.M.I.) Health Questionnaire (1) seems a suitable starting point. It is a self-administered questionnaire designed as an aid to diagnosis with particular emphasis on the importance of covering a wide range of conditions. The Questionnaire consists of 195 questions divided into 18 sections relating to bodily symptoms, past illnesses, family medical history, behavior, and mood or feeling. The subject is asked to answer each question with a "yes" or "no." Its compilers made the suggestion that it would be suitable as a survey technique. The Index has been used to provide an assessment of emotional disturbance and for military induction (3) as well as screening for jobs in industry (7). In addition, it has been shown that the crude score for older subjects (hospital outpatients) was higher than for younger ones (2). Separate scores for number of bodily complaints and moods and feelings were obtained, and the rise in score with each was found to be due to the increase in the score for the bodily compaints, that derived from the sections on moods and feelings remaining constant.

HYPOTHESIS TO BE TESTED

It has already been mentioned above that the C.M.I. was found to yield a higher score for older people than for younger ones (2). This was in the hospital environment. But if the C.M.I. has validity as a survey instrument, one would expect it to show the same gradient in scores when used in a group which had no particular motivation for supplying the information. This, then, was the first hypothesis we wished to test.

Second, useful evidence of the validity of the C.M.I. in the survey situation would be by its ability to discriminate between a group of subjects who had recently had an illness as against a group which had not.

SUBJECTS

The groups of subjects from whom completed C.M.I.s were obtained were employees of Scottish Region, British Railways. By agreement with the railway authorities and the three

trade unions, railwaymen were invited to co-operate in the research by bringing a completed C.M.I. when they reported to the railway doctor. It was guaranteed that the questionnaire would be passed directly to the research team under conditions of complete anonymity.

Railwaymen are required to report for medical examination for two main reasons: (a) because they have been absent on account of illness (for about a month)—these constitute Group A; or (b) for examination prescribed by regulations (mainly eyesight tests)—these constitute Group B. The railway doctor indicated under which set of circumstances the man had reported to him.

Blank C.M.I.s were issued by the man's department when informing him that he was required to report for interview. In all, 439 forms were issued by the departments and the returns consisted of 111 people in Group A and 102 people in Group B. A further 26 forms in respect to a group of men who reported for routine medical examination were also collected, but these were not used in the analysis. Thus there were 239 forms in all, constituting 55% of the total contacted. We consider this a very satisfactory level of cooperation, in view of the fact that the research workers had no direct contact with the subjects.

With the strict conditions for anonymity it would have been difficult to obtain the information to compare the non-responders with responders in any way, but we have no reason to suppose that the responders do not form a sufficiently representative sample for the limited purposes of the inquiry of the relevant railway grades in a large urban area of Scotland.

RESULTS

The distribution of the subjects by age in 5-year aggregates is shown in table 1. Since the routine examinations bunch around the fifth and tenth years, the quinquennial age-group has these points at its center, e.g., 23-27, 28-32. There is also a striking difference in age distribution between Group A (sickness absence group) and Group B (routine eyesight test). There is some tendency in Group A for older persons to have somewhat greater representation, although all age groups are represented. By contrast, in Group B there is a decided bunching in the ages 43-57, probably associated with promotion. The net effect is that Group A has relatively more of the younger end of the older people than Group B.

Table 1 shows also the scores for the age ranges in the three groups in the terms of the mean, the maximum, and the minimum. The means at each range of Group A are higher than those of Group B. Throughout it will be

TABLE 1. DISTRIBUTION OF SCORES.

Age	Group A Sickness Absence				Group B Routine Eyesight Test				P*
	No.	Score			No.	Score			
		Mean	Max.	Min.		Mean	Max.	Min.	
Under 23	1	(3)	....	....	....	.....	....	....	.....
23 - 27	3	(10)	(17)	(3)	....	.....	....	....	.....
28 - 32	12	8.33	17	0	8	5.75	19	1	.1166
33 - 37	12	9.17	27	0	1	(18.00)	....	....	.....
38 - 42	6	11.00	37	0	1	(3.00)	....	....	.....
43 - 47	10	13.00	37	1	29	9.76	41	1	.3199
48 - 52	12	12.33	23	2	19	6.58	23	0	.0234
53 - 57	16	17.31	50	5	21	10.62	38	1	.0119
58 - 62	25	14.68	44	3	16	9.56	51	2	.0706
63+	14	12.50	40	1	7	8.86	20	1	.4146
	111				102				

Numbers in parentheses refer to data based on small numbers of subjects.
* Difference of means based on log scores.
* Difference of means based on log scores.

seen that there is a large scatter, perhaps greatest in the higher age ranges of both Group A and Group B.

This information was later confirmed by calculation of the variances which suggested that the transformation of the scores to a logarithmic scale might be useful.

In both Group A and Group B the mean score increases with increasing age (from age range 28-32 until the age range 53-57) and then falls, but this is more regular and more marked in Group A than in Group B.

So far the exploration of the Cornell Medical Index is encouraging, but on account of the very high scatter of the scores and the irregular age distributions some more detailed statistical examination is essential. It is necessary to explore the levels of significance at which (a) the scores within each group vary with age, and (b) the scores between groups differ from one another after allowing for age.

Effects of Age.—Correlations of scores with age are shown in table 2. In view of the high scatter, the scores were subjected to a logarithmic transformation. In Group A the correlation of 0.295 is significant at the level of $p = 0.003$, while in Group B the correlation is 0.102 and is significant at level $p = 0.235$. (Null hypothesis:—no correlation with age.) There can be very little doubt that the score increases with age in Group A. There may, however, be a lesser increase in Group B.

The Differences between Groups.—We examined the distribution curves for the scores in Group A and in Group B, lumping together all the ages. To overcome the difficulties arising from the great variability, they were grouped into 10 equal intervals for both the crude score (0-4, 5-9, ... 45-50+) and the log score (0-0.169, 0.170-0.339, 0.340-0.509, etc.). The frequency distribution curves based on crude scores were highly skewed toward the low scores, especially in Group A. The effect of the log transformation was to make the curve much flatter, but there were great irregularities in both groups, although they still differed markedly from one another. Further discussion of those distributions is unprofitable at this stage because the age distributions of the two groups are so different.

Other (unpublished) data which we have examined, and in which the age of men was controlled, supports the ability of the C.M.I. to discriminate between a group showing evidence of illness on other (independent) grounds and one not showing such evidence.

To see whether there were differences between Group A and Group B, regression lines for the log score on age were fitted, and it was found by analysis of variance that the two lines were different at a high level of significance. There are, however, two difficulties in accepting this. The first is that the age distributions are different and the second is that from table 1 it can be seen that a straight line is not the best fit. There is a marked fall in the last two age groups. Elsewhere (8) we have shown that the sicker people leave the labor force as they get older. This might account for the ultimate drop. Accordingly, the differences between means of log scores at each age were examined. These results are shown in the last column of table 1. The 't' test for differences between means were used. Reference to table 31 of the *Biometrika Tables for Statisticians* (11) shows that the variances are comparable. It will be seen that all the differences between means are of the same sign and that they are significant at the level of 0.02 and 0.01 in the age ranges 48-52 and 53-57, respectively, and at the level of 0.07 at the age range 58-62.

All the probabilities were combined by Fisher's method as outlined by Tippett (13).* This gives a combined probability of the $p = 0.00024$. There is thus very little doubt that at each age the scores in Group A are higher than those in Group B.

* The detailed protocols are available on application.

TABLE 2. CORRELATION OF SCORE WITH AGE.

	N	$\sigma_{\bar{r}} = \frac{1}{\sqrt{N-1}}$	Crude Score			Log Score		
			r	$\frac{r}{\sigma_{\bar{r}}}$	p	r	$\frac{r}{\sigma_{\bar{r}}}$	p
Group A	111	.0953	.227	2.38	.623	.295	3.10	.003
Group B	102	.0995	.073	0.73	.305	.102	1.03	.235

DISCUSSION

Both hypotheses have been substantiated, although there is clearly much room for improvement in the results. Two sources of fluctuation seem to be important: 1) the composition of our groups; 2) the system of scoring of C.M.I.

1) *The composition of the groups.*—The occupations of those in Group B are relatively homogeneous, but the age distribution is bunchy. Group A comprises all occupations, whereas the grades that are required to undergo routine examinations (Group B) have a low sickness experience by comparison with the generality of railwaymen. The people in Group A are there because of recent sickness experience and thus, even though they are wishing to return to work, they will have higher scores. The difference in scores between the two groups will thus be larger than that to be expected between two occupational groups and is in this sense favorable to the task of seeing whether the C.M.I. can distinguish between defined groups.

As a further step it would be desirable to compare the scores of occupational groups that are known to have widely different sickness experience, for example, certain grades in our larger inquiry regarding sickness experience and job change among railwaymen.

2) *The scoring system of the C.M.I.*—The examination of the applicability and limitation of the C.M.I. has been on the assumption that the composition of the questionnaire is unaltered and the weightings of the items identical and additive. The next step would seem to be the reweighting of the items in order to see whether its validity could be improved. At first sight it would seem reasonable that an item such as Question 1: Do you need glasses to read? should have a different weight from another, Question 23, Have you ever coughed up blood?

But as striking is the fact that in certain sections there are a number of questions covering the same ground, i.e., Section J, Question 115, Are you frequently ill? Question 116, Are you frequently confined to bed by illness? Question 117, Are you always in poor health? Question 118, Are you considered a sickly person? Question 123, Are you constantly made miserable by poor health?

The inclusion of all these may be important in certain clinical psychiatric situations, but in survey situations it presents a substantial opportunity for erroneous affirmative answers. Thus repetitiveness provides any easy means of spuriously increasing scores and adding to the variance which, as we have already noted, is extremely high. An item analysis might eliminate much of this.*

SUMMARY

Completed C.M.I.s were obtained from a group of 239 railwaymen under survey conditions. The scores were found to reveal the expected age gradiant and to discriminate between those who had recently experienced a sickness absence and those who had not. It is concluded that the C.M.I. is a suitable technique for use under survey conditions. A reweighting of the C.M.I. items is recommended.

REFERENCES

1. Brodman, K., Erdmann, A. J., and Wolff, H. G.: *Cornell Medical Index—Health Questionnaire Manual*, Cornell University Medical College, New York, 1949.
2. Brodman, K., Erdmann, A. J., Lorge, I., and Wolff, H. G.: Cornell Medical Index—Health Questionnaire VI (The Relation of Patients' Complaints to Age, Sex, Race and Education) *J. Gerontol. 8:* 339-340, 1953.
3. Brodman, K., Erdmann, A. J., Lorge, I., Deutschberger, J., and Wolff, H. G.: Cornell Medical Index—Health Questionnaire VII (The Prediction of Psychosomatic and Psychiatric Disabilities in Army Training). *Am. J. Psychiat., 3:* 37-40, 1954.
4. Coombs, C. H.: Theory and Methods of Social Measurements, Chapter II in: Festinger L., and Katz, D., *Research Method in the Behavioural Sciences.* Staples Press, Ltd., London, 1954.
5. Ellis, A.: The Validity of Personality Questionnaire. *Psychol. Bull. 43:* 385-440, 1946.
6. Emerson, H.: *Administrative Medicine.* Williams, Wilkins & Co., Baltimore, 1952, p. 511.
7. Erdmann, A. J., Brodman, K., Deutschberger, J., and Wolff, H. G.: Health Questionnaire Use in Industrial Medical Department. *Indus. Med. & Surg., 22:* 355-357, 1953.
8. Gordon, C., Emerson, A. R., and Pugh, D. S.: Patterns of Sickness Absence in a Railway Population. *Brit. J. Indust. Med.*, 1959 (in press).
9. Larson, W. R.: Social Desirability as a Latent Variable in Medical Questionnaire Responses. *Pac. Sociol. Rev., 1:* 30-33, 1958 *(Sociol. Abstracts, 6:* No. 5198, 1958).
10. McNear, Q.: Opinion-Attitude Methodology. *Psychol. Bull., 43:* 289-374, 1946.
11. Pearson, E. S., and Hartley, H. O.: *Biometrika Tables for Statisticians. 1.* Cambridge University Press, Cambridge, England, 1954.
12. Stocks, P.: *Sickness in the Population of England and Wales in 1944-1947.* Studies in Medical and Population Subjects No. 2. H.M.S.O., London, 1949.
13. Tippett, L. H. C.: *The Methods of Statistics.* Williams & Northgate, Ltd., London, and John Wiley & Sons, Inc., New York, 1931.

* A recent paper by Larson (9) would also seem to be relevant.

GERIATRIC PRACTICE

HEART DISEASES IN OLD AGE

2. TREATMENT*

TORBEN GEILL, M.D.‡

TREATMENT

Even though the treatment of cardiac diseases in old persons in general follows the same lines as in young and middle-aged subjects, significant differences exist in various areas. This is especially true with regard to arteriosclerotic heart diseases, which are predominant among elderly persons.

A characteristic feature associated with decompensated heart disease in old individuals is the great tendency to the development of hypostatic bronchopneumonias which may subsequently constitute the immediate cause of death. Elderly cardiac patients are furthermore particularly susceptible to infections, excessive environmental changes, traumatic lesions, and severe psychic stress. This increased susceptibility reflects the decreased compensatory ability of the old organism (decreased homeostasis).

Various considerations of a general nature are therefore of special importance in the treatment of cardiac disease in elderly persons. It is possible to outline such directives, but the type of the heart disease will of course be of decisive importance in the choice of the therapeutic measures.

As a general rule any unnecessary stress on the heart should be avoided. Obese patients should therefore undergo suitable weight reduction, but a too rapid weight loss must be avoided, since this will generally produce unnecessary tiredness. It is therefore advisable to let the reduction program extend over a period of 6 months to one year. The salt and fluid intake should be appropriately limited, especially if the patient shows signs of cardiac decompensation, but at the same time the possible risk of inducing dehydration must be kept in mind.

The diet of elderly persons should not contain too much fat, and the intake of carbohydrates should be moderate. In contrast to this, a high protein content of the diet must be considered as desirable, provided the renal function of the patient is not appreciably impaired. In patients suffering from coronary disease, special consideration must be given to the content of animal fat in the diet. If the patient is suffering from angina pectoris, or if he has already experienced an attack of coronary occlusion, the amount of animal fat in the diet (especially butter, milk, cream, cheese, lard, and fat meat) should be reduced to a minimum. The animal fat can be replaced by various vegetable oils with a high content of unsaturated fatty acids (soy bean oil, peanut oil, sunflower seed oil, corn oil). The use of this type of vegetable fat is particularly indicated if the serum cholesterol level is elevated. A complete replacement of the animal fat in the diet with the above mentioned vegetable oils in an amount of about 100 Gm. daily will usually result in a reduction of the high cholesterol serum concentration to a normal level. The use of the so-called lipotropic substances (choline, lecithine, inositol, and polysorbate) occasionally act in a similar way.

Consumption of coffee and tea is permissible to a moderate extent, provided the patient does not exhibit a tendency to extrasystoles or to attacks of paroxystic tachycardia, auricular flutter, or fibrillation. Elderly persons with marked nervous symptoms and patients whose sleep tends to be disturbed by the intake of coffee and tea should avoid these beverages. It is, however, a rather frequent experience that the intake of coffee, instead of affecting the sleep in an unfavorable way, tends to promote sleep as the result of the effect of caffeine on the cerebral circulation.

Smoking. The question whether excessive use of tobacco, particularly cigarette smoking, accelerates the development of coronary sclerosis has not yet been settled, although many facts favor this contention. It has, however, been definitely established that nicotine can elicit arterial spasms and produce attacks of angina

Submitted for publication November 8, 1958.

* Part 1 was published in JOURNAL OF GERONTOLOGY, *14*: 59 - 67, 1959.

‡ Medical Director, De Gamles By, Copenhagen, Denmark.

pectoris. For this reason smoking should be discontinued, or at least greatly limited, in patients exhibiting frequent attacks of angina pectoris or who have previously suffered an episode of coronary thrombosis.

Bed rest. The use of bed rest in elderly cardiac patients has been greatly reduced during the last several years, and this must be considered definite progress. A case of severe cardiac disease with pronounced decompensation can of course necessitate absolute bed rest, or bed rest with the patient being allowed to sit in a chair only while the bed is being made. The problem concerning the duration of bed rest following coronary occlusion will be discussed in greater detail later. It can be stated as a general rule that all cardiac patients should carry out exercises and walking practices under the direction of the physician if such activities can be arranged and are considered recommendable. Continued bed rest or confinement to a chair may cause the development of complications such as bed sores, phlebitis, and pulmonary embolism. The limitation of the patient's activities may furthermore give rise to a neurotic condition. It is also a well-known fact that elderly debilitated cardiac patients who are maintained in bed frequently develop urinary infection and incontinence. Lack of exercise may finally lead to overweight, which represents a further load on the heart.

Work and professional activities. The extent to which patients with compensated cardiac disease or with symptoms of active coronary sclerosis should be permitted to continue working must be decided by the physician in each case through evaluation of the patient's financial, social, and personal circumstances. Many elderly employees and workers have already retired, but an appreciable percentage of business executives still remain active. The work load of such patients can be reduced by the discontinuation of unpaid activities, like participation in board meetings, society meetings, etc. Elderly cardiac patients should furthermore be advised to take one hour of rest daily during the working period.

Coronary sclerosis. In the treatment of patients with coronary sclerosis who exhibit attacks of angina pectoris, the physician has a choice of a variety of vasodilating drugs, particularly nitroglycerin, but also the long-acting nitrite preparations. With regard to khellin, which in animal experiments has been proved to possess a marked coronary dilating effect, opinions about its clinical value differ. This preparation frequently causes gastro-intestinal symptoms (vomiting, diarrhea), which necessitate the discontinuation of the drug. The recently introduced marsilid is reported to have a beneficial effect in the treatment of angina pectoris, even in patients where other preparations have been found ineffective. Clinical experience with this drug is, however, as yet insufficient to permit a final evaluation of its effectiveness. It is furthermore not possible to generalize about this category of drugs; they must be tested in each case, and the effect is most probably dependent on the degree to which the collaterals are susceptible to their vasodilating action. The fact that the coronary dilating drugs often prove ineffective is not surprising when one has had the opportunity at autopsy to note the extent to which these vessels are the site of atheromatous changes and are calcified, narrowed, or completely obliterated. The use of a variety of other compounds, including testosterone propionate, organ extracts, and vitamin E, has not given convincing results. A brief treatment with heparin can hardly be considered rational, and a prolonged treatment with this compound with the purpose of achieving a lipolytic effect has not resulted in unequivocal clinical improvement. Prolonged therapy with anticoagulants of the dicumarol type in cases of severe angina pectoris has in some cases reduced the incidence of angina pectoris attacks, probably because many of these attacks are caused by thrombosis of the small branches of the coronary arteries and the anticoagulant treatment prevents their continued occurrence.

In addition to the medicinal treatment of angina pectoris, a regulation of the patient's activities is of the greatest importance. Unnecessary physical exertion, exposure to cold, and outdoor walking in windy weather should be avoided. Obesity must be corrected and the caloric intake limited, particularly with regard to animal fats. Smoking should be reduced to a minimum, or preferably be discontinued.

Surgical treatment of angina pectoris has gained ground during the last several years. The Beck operation with constriction of the coronary sinus and scarification of the surface of the heart with the purpose of establishing new collaterals frequently has resulted in a definite improvement of the patient's condition;

the incidence of improvement has been reported to be about 90%. Approximately one-half of these patients are completely relieved of attacks of angina pectoris and have been able to resume work without restrictions. Not all patients with angina pectoris are, however, suitable candidates for such operation; this includes cases with cardiac decompensation or marked cardiac enlargement and patients who have suffered episodes of severe coronary occlusion within the last three months. The best results are observed in patients who have only exhibited signs of coronary insufficiency without occlusion.

Coronary thrombosis. Treatment of coronary occlusion in elderly persons is in general similar to that applying to middle-aged individuals and includes bed rest and administration of morphine, anticoagulants, and possibly penicillin. The previously held point of view that complete bed rest should be rigidly enforced for 4-8 weeks has been revised during the last several years. It is particularly advisable in elderly individuals to shorten the period of bed rest in order to prevent the development of hypostatic pneumonia, thrombophlebitis with pulmonary embolism, and bed sores. In addition, elderly persons who are confined to bed for a long time are apt to develop urinary incontinence, urinary infection, and changes in the joints and muscles due to inactivity, which may make the subsequent physical training difficult. These aspects make it advisable to allow the patients to get out of bed at an early stage, usually after 1-2 weeks, depending on the severity of the case. The policy of allowing the patients to get out of bed on the day following the attack of coronary occlusion, as has been recommended from various sides, is not feasible for elderly persons, who exhibit signs of shock and reduced blood pressure. To allow the patients to sit in a chair under such conditions may result in collapse, with a subsequent serious risk of an aggravation of the myocardial infarction. Another consequence of a too early discontinuation of complete bed rest is the increased load on the heart occurring at a stage when the myocardial infarct has not yet been converted into fibrous tissue, and this may cause the development of dilatation of the heart and cardiac insufficiency. It should be mentioned in this connection that many elderly cardiac patients who are allowed out of bed at an early stage do not always realize the necessity of remaining in the chair according to the physician's directions, but often use the opportunity to walk around and in this way expose themselves to physical strain.

The severe episodes of collapse associated with coronary occlusion carry a serious danger for a fatal outcome of the disease, and a promptly instituted therapy aimed at increasing the blood pressure is therefore required. The previous use of blood transfusions cannot be recommended because the resulting augmentation of the coagulability of the blood greatly increases the risk of an additional thrombus formation. The preferred treatment is intravenous drop-wise infusion of norepinephrine. This procedure must often be continued for days or weeks before the patient is out of danger. If the patient is cyanotic and dyspnoic, administration of oxygen is indicated.

Treatment with penicillin or other antibiotic drugs during the course of coronary thrombosis must be considered when there is evidence of chronic infection (cholecystitis, urinary infection, chronic bronchitis) and in case of the occurrence of thrombophlebitis or bronchopneumonia. The use of antibiotics is especially indicated in patients who develop hypostatic bronchopneumonia as the result of cardiac insufficiency. The importance of a prophylactic treatment with these drugs has not as yet been established.

The main treatment of coronary thrombosis consists in the administration of anticoagulant drugs. The general principle of the therapy is the same as in middle-aged persons, but two important circumstances must be considered, namely 1) that old patients usually are more sensitive to anticoagulants, including heparin and drugs of the dicumarol type, and 2) that old patients often have low prothrombin levels, which make it necessary to select a dicumarol dose under consideration of the original prothrombin value.

In the initial heparin treatment, the purpose of which is to effect a rapid reduction of the coagulability of the blood, the preparation is given either intravenously or, more practically, as a concentrated solution subcutaneously. Intramuscular administration is not recommended because of the possibility of the development of large hematomas in the highly vascularized muscular tissue. A cautious dosage of heparin is generally advisable in old patients; thus the subcutaneous injection of 150 mg. of heparin twice daily over a period of two days is usually well tolerated. The therapeutic effect of each

injection lasts about 12-14 hours, and two injections will therefore cover the 24-hour period adequately. If the dose is increased to 400-500 mg./24 hours, serious hemorrhage from *solutiones continui* may result; thus hematuria is often encountered in patients with cystopyelitis, and melena may occur in individuals suffering from diverticulosis of the colon or tumors of the gastrointestinal tract. Simultaneously with the heparin administration, treatment with a suitable preparation of the dicumarol group is started. The compounds with protracted action seem to be best suited for elderly persons, because too great changes in the prothrombin values must be considered as undesirable since they carry the risk of new thromboses.

Concerning the choice of the initial dose of an anticoagulant of the dicumarol type it is, as previously mentioned, necessary to take into consideration the existing prothrombin level, because this value is frequently reduced, often to a marked extent, in elderly persons. If a dicumarol dose is administered similar to that employed in young persons, the reduction in the prothrombin level may be excessive and may cause a hemorrhagic diathesis necessitating the use of K_1-vitamin. Through the use of a dicumarol compound with protracted action, it is frequently possible to maintain a prothrombin level with only minor fluctuations. One should attempt to maintain the prothrombin concentration within the so-called therapeutic range, between 20 and 30% of the normal value, a range in which a tendency to bleeding and to thrombus formation rarely occurs. It is generally advisable, if possible, to maintain the prothrombin level in the lower part of the abovementioned range, or between 10 and 20% of the normal value, because the thrombosis-preventing effect is more certain at this level. The reason the low prothrombin value in some instances nevertheless does not protect against thrombus formation is that, although the coagulation mechanism is dependent chiefly on the prothrombin concentration, other coagulation factors must also be considered. This applies particularly to thromboplastin, the level of which is often abnormally increased during the acute stage of coronary thrombosis, and the augmented thromboplastin concentration may thus lead to thrombosis in spite of a low prothrombin value. According to recent investigations, the dicumarol preparations also seem to be able to suppress the thromboplastin concentration in addition to the prothrombin and proconvertin values, but a comparatively long time (1-2 weeks) is usually required to achieve a lowering of the thromboplastin level, and it is during this period that a danger of thrombus formation exists in spite of the presence of a low prothrombin concentration. For ordinary clinical management, however, the control of the prothrombin level must be considered an adequate procedure.

Because of the great sensitivity which is frequently encountered in individuals toward compounds of the dicumarol type, a hemorrhagic diathesis occurs rather frequently, especially if the initial dose has not been chosen on the basis of the patient's prothrombin concentration. In most instances the hemorrhagic diathesis will first be discernible by the occurrence of microscopically demonstrable hematuria. Macroscopic hematuria, and hemorrhages from the intestinal tract, the vagina, and in the skin are comparatively rare. The peroral intake of small quantities (5-10 mg.) of K_1-vitamin will usually abolish the hemorrhagic diathesis within 1-2 hours. In those cases in which the hemorrhagic diathesis has reached dangerous proportions and requires immediate therapeutic measures, the intravenous injection of 5-10 mg. of K_1-vitamin (as an emulsion in polysorbate) will yield satisfactory result in as little as 30 minutes. Larger doses of K_1-vitamin should be given only in exceptional cases, because the administration of too large doses will result in a too great increase in the prothrombin level of the blood, which involves the risk of new thrombus formation and makes the reestablishment of a proper prothrombin level with dicumarol difficult.

In such cases without hemorrhages where the prothrombin level falls to below 5% it is necessary to raise the level to within the therapeutic range in order to prevent a tendency to hemorrhages. This may be accomplished by the administration of small doses of vitamin K_1. A dose of 1-2 mg., given personally, is usually sufficient (fig. 1).

During the last several years the long-term treatment with dicumarol has gained considerable ground and is being used chiefly in patients who have suffered one or more attacks of coronary thrombosis. The available statistical data support the contention that it is possible through such therapy to reduce the mortality significantly, especially within the first 2

years. The dicumarol preparations with protracted action seem to be preferable also under these circumstances. Attempts should be made to maintain the prothrombin level between 10 and 30%, and preferably between 10 and 20%. Blood tests should be made every 2-4 weeks, and the patients must be carefully instructed about the risks associated with the treatment. This is of special importance for patients who travel to foreign countries and no longer are under medical supervision. Under such circumstances the patients should be advised to take along one or several ampoules of K_1-vitamin solution and should be carefully instructed about the recommended dose in case of the occurrence of hemorrhagic diathesis. It should be noted that various drugs, for instance salicylates, barbiturates and antibiotics, are capable of lowering the prothrombin level to a minor extent, and this fact must be considered when such drugs are prescribed for patients who are undergoing long-term therapy with anticoagulants.

In addition to the short-term and long-term treatment of coronary occlusion with anticoagulants of the dicumarol type, the use of such drugs is also indicated in elderly persons who are subjected to massive treatment with diuretics or who have suffered traumatic hematomas, sugillations, or tissue injuries. Such conditions will result in an increased passage of tissue thromboplastin into the circulation, and the coagulability of the blood will therefore increase considerably over a shorter or longer period. This will result in a greater tendency to thrombus formation in the veins, with possible subsequent pulmonary embolism, but may also lead to coronary thrombosis. It is of great importance that more attention be given in the future to the prophylactic treatment of threatening thrombosis.

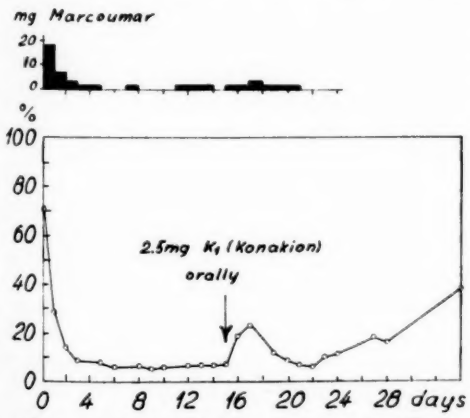


Fig. 1. Oral administration of vitamin K_1 (Konakion) in connection with continuous Marcoumar treatment. Abscissa: days after first dose of Marcoumar; ordinate: Prothrombin-proconvertin concentration (P-P value) in % of normal. Reprinted with permission from H. Dam, T. Geill, E. Lund, and E. Søndergaard: Laboratory and Clinical Experiments with Various Anticoagulants, published in *Thrombosis and Embolism*, Benno Schwabe & Co., Basel, 1954.

In patients presenting signs of *acute coronary insufficiency* due to deficient coronary circulation resulting from large losses of blood or shock, a blood transfusion will quickly improve the condition.

Hypertensive heart disease. In patients suffering from hypertensive heart disease the main aspect of the therapy is the control of the elevated blood pressure. The introduction of the modern antihypertensive drugs represents a considerable advancement in the field of geriatrics. It can be stated as a general rule that patients with an elevated systolic blood pressure who exhibit a normal diastolic pressure usually do not require treatment with antihypertensive drugs. Only if the condition causes severe subjective symptoms such as dizziness, headache, and tiredness should the use of such drugs be considered. If the hypertension is associated with a definite elevation of the diastolic blood pressure a therapy with antihypertensive agents is indicated. Individual circumstances are of importance in the choice of the compound to be used. Many old patients often respond well to treatment with rauwiloid preparations which generally have few side effects. In contrast to this, the use of the stronger acting ganglionic blocking agents is associated with an extraordinarily high incidence of unpleasant by-effects in elderly persons; according to the experience of the author this is particularly the case in patients above the age of 80 years. A sudden drop in blood pressure, followed by syncope and severe collapse, is encountered comparatively frequently, and the development of coronary occlusion is by no means rare. The best results seem to be obtainable in such patients through a combined treatment with rauwiloid preparations and small doses of the ganglionic blocking agents.

Cases of hypertensive heart disease with cardiac decompensation should be treated in the usual way with digitalis and diuretics.

Decompensated heart diseases. The treatment of cardiac decompensation in the senium is similar to that pertaining to other age groups and includes bed rest, limitation of fluid and salt intake, and administration of digitalis and diuretics. In order to prevent the development of bronchopneumonia and thrombophlebitis, bed rest is not enforced strictly for older patients, who, if the condition permits it, should be allowed to sit up in bed one or more times daily even in the presence of moderate decompensation. The use of special cardiac beds is recommended for patients with marked dyspnoea at rest.

Concerning the treatment with drugs, digitalis is the most significant remedy in the therapy of cardiac decompensation in the senium as in young and middle-aged patients. One special point should, however, be given consideration in elderly patients. Because of their great tendency to cumulation preparations of the digitoxin type are less suitable for aged persons; these drugs often produce symptoms of digitalis intoxication, particularly if the kidney function is impaired. The compounds with less tendency to cumulation are therefore to be preferred. The classical standardized digitalis leaf tablets which have acquired great popularity in Scandinavia are usually well tolerated by elderly cardiac patients in spite of a not inconsiderable cumulation, but in general the lanata type preparations are to be preferred because of their low cumulative effect. It is often necessary during the treatment to reduce the maintenance dose of digitalis somewhat, to about one-half of the ordinary dose or less in elderly patients, because overdosage otherwise may occur. Extrasystoles are frequently elicited by digitalis medication in aged persons, and the arrhythmia quite often assumes the character of bigemini or trigemini. Under such conditions it is advisable to discontinue the digitalis administration for a while. A Cohn effect is often encountered in the electrocardiogram in elderly cardiac patients undergoing digitalis treatment; such phenomenon seems, however, to occur predominantly in patients who already are suffering from a severe myocardial disease. The occurrence of a Cohn effect does not, however, necessitate discontinuation of the digitalis therapy.

The indication for digitalis treatment in elderly patients with rapid auricular fibrillation does not differ from that in other age groups. This condition of auricular fibrillation associated with normal or even slow ventricular rate, which is encountered fairly frequently in the senium, does not, however, constitute an indication for digitalis therapy unless signs of decompensation also are present. Intensive digitalization in patients with preexisting slow auricular fibrillation carries the risk of the development of sino-auricular or atrio-ventricular block.

The use of strophantin in elderly cardiac patients follows the usual indications. It is, however, necessary to be very cautious with the dosage and always to start with a small trial dose. In addition, one must ascertain that the patients are not already under digitalis treatment, because the strophantin injection in that case may produce irregular tachycardia with cardiac insufficiency and even cardiac arrest in diastole.

In connection with the digitalis therapy, treatment with diuretics is of very great importance in decompensated heart conditions in elderly individuals. A large series of very effective diuretics is available, especially the mercurial diuretics for peroral use, in the form of suppositories, or for parenteral (subcutaneous, intramuscular, or intravenous) administration. Among the newest diuretics should be mentioned acetazolamide, which inhibits the carbonic anhydrase activity in the renal tubules and thus reduces the reabsorption of bicarbonate and of sodium. This drug seems, however, to lose its effectiveness to some extent when the bicarbonate concentration is low and is most suitable in conditions of less severe decompensation. The best effect in elderly patients is obtained with small doses (125-250 mg.) of this drug, whereas the effect rapidly diminishes with larger doses. Chlorothiazide which was introduced in the therapy recently has been found to be very effective also in elderly persons. This drug acts chiefly through an increase in the chloride excretion and also causes a considerable loss of potassium in the urine. The effect seems to persist even after prolonged usage. It should be emphasized, however, that the new diuretics must be used under close medical supervision, since the unrestricted use of the preparations may involve danger in several ways. One of the most immediate consequences of their usage is the electrolyte loss, caused by intensive and frequent treatment with diuretics; this loss seems to be more marked in elderly persons than in younger adults. The reason

for this difference is most likely that older individuals possess smaller electrolyte reserves and consequently find it more difficult to compensate for an equilibrium disturbance (reduced homeostasis). Thus it is often difficult to replace the potassium loss induced by chlorothiazide through peroral administration of potassium salts. An effective electrolyte control is therefore of particular importance in elderly cardiac patients, and possible changes in the electrolyte values should be corrected immediately through adequate salt and fluid administration. Attention should also be directed toward a possible urinary loss of water-soluble vitamins, particularly thiamine, in connection with prolonged diuretic therapy. This is of special importance, because a large loss of thiamine may lead to beri-beri edema, which may be indistinguishable from edema of cardiac origin. Administration of thiamine under such circumstances will result in the disappearance of the beri-beri edema.

A third problem which must be kept in mind in connection with the use of diuretics is the considerable influx of tissue thromboplastin into the circulation caused by the therapy. As a consequence of the augmented blood thromboplastin concentration the tendency to thrombus formation increases (hypercoagulability; thrombophilia), and in elderly subjects the possibility of the occurrence of thrombi in the veins (especially the pelvic veins and the veins of the lower extremities) and in the arteries (particularly the coronary and cerebral arteries and the aorta) is considerable. The development of pulmonary embolism in elderly cardiac patients undergoing diuretic therapy is therefore quite frequent. In order to avoid the danger of thrombus formation under such circumstances it is desirable, as previously mentioned, to institute a simultaneous therapy with anticoagulants.

In aged cardiac patients of the plethoric type, periodic venesection is very useful since attacks of pulmonary edema may thereby be prevented.

With regard to the use of morphine, opiates, sedatives, and hypnotics great caution should be exerted, not only in old persons in general, but particularly in old cardiac patients. Also the modern tranquillizers, especially meprobamate, frequently have an undesirable, marked, sedative effect in the senium, even when given in moderate doses, and these drugs should therefore be used with great caution in cardiac patients. In elderly patients made soporous through the use of drugs, the danger of aspiration pneumonia is considerable, and in such cases the prognosis is practically hopeless. Concerning the use of morphine and other opiates, the fact that these preparations reduce the sensitivity of the respiratory center to a considerable extent may have serious consequences when dealing with patients already exhibiting signs of cyanosis. Particularly in cases of chronic cor pulmonale the use of morphine may have a fatal effect; the patient may pass into a soporous state, from which he does not awaken. The physician in charge of the patient may get the impression that it is the cardiac condition itself which has caused the death, whereas it actually is the morphine which, through its action on the respiratory center, has produced a slow suffocation. The therapy which generally has proved most effective for the relief of cyanosis and dyspnoea in elderly cardiac patients, especially those suffering from chronic cor pulmonale, is the administration of oxygen through an inserted tube, preferably in connection with intubation or the use of a respirator.

In geriatric medicine quinidine is also one of the main drugs used in the treatment of a variety of arrhythmias. As previously mentioned, extrasystoles rarely cause appreciable troubles in elderly persons as compared with young patients, and treatment of this condition with quinidine is therefore not often required. The dose is the usual one, 100-200 mg. t.i.d. Coupled extrasystoles (bigemini, trigemini) which occur frequently during digitalis therapy disappear promptly following temporary withdrawal of digitalis. In patients with paroxystic tachycardia, auricular fibrillation, and auricular flutter, a prophylactic treatment with quinidine will often prevent the attack. In cases of manifest paroxystic tachycardia the effect of quinidine is, however, less certain, although intravenous administration may prove successful. One must otherwise take recourse to drugs of the carbocholine or procainamide types. Auricular flutter in the senium responds best to digitalis in the ordinary saturation dose. In auricular fibrillation in elderly persons, treatment with quinidine has proved less effective than in young individuals; this must be considered a natural consequence of the basic disease, which in the senium generally is coronary sclerosis or hypertension. For the same reason the risks associated with quinidine treat-

ment of auricular fibrillation in the senium are very great, and the occurrence of episodes of collapse and embolism is by no means rare. A condition of auricular fibrillation which has persisted for a long time should therefore call for great caution, especially if the fibrillation is associated with considerable dilatation of the heart; a simultaneously existing cardiac decompensation likewise constitutes an absolute contraindication for the use of quinidine therapy. In those patients where thyrotoxicosis is the cause of the auricular fibrillation, which is the case much more frequently than is generally assumed, the underlying disorder should be treated rationally before one can expect to obtain a conversion of the arrhythmia.

SURGICAL RISKS IN ELDERLY PERSONS

The considerable increase in surgical procedures effected in elderly persons necessitates a clarification of the conditions which make it advisable to carry out major surgery. In this connection the state of the heart represents a factor of great importance.

Pathologic-anatomical studies of the heart in aged persons have revealed the high incidence of myocardial lesions. Thus myofibrosis and scars of myocardial infarcts are encountered in about 40% of the individuals, and cardiac hypertrophy in an additional 30% of the subjects. Furthermore, a fairly large number of old persons develop cardiac athrophy with deposits of brown pigment in the myocardial cells. Under ordinary conditions these changes do not necessarily lead to a reduction of the cardiac power. But under special circumstances, as in the case of major surgery, larger demands are made on the heart (increase of minute volume), and this fact, in connection with peripheral circulatory disturbances, may lead to the development of cardiac insufficiency. Such course of events cannot be predicted, but a number of absolute and relative contraindications can be listed which must be taken into consideration in connection with the decision on the advisability of submitting the patient to surgery. Under conditions of emergency, however, vital indications for surgery may of course exist which eliminate all other considerations.

The absolute contraindications are:

1) Attacks of coronary occlusion or coronary thrombosis suffered within the last 2 months.
2) Cardiac decompensation.

The relative contraindications include:

1) Severe coronary sclerosis with frequent attacks of angina pectoris.
2) Syphilitic aortitis with stenosis of the coronary ostia.
3) Adams-Stoke's syndrome.
4) Severe aortic stenosis.
5) Severe pulmonary artery stenosis.

In patients suffering from a not too severe degree of decompensation, treatment with digitalis and diuretics may bring them into a condition acceptable for surgery. In auricular fibrillation of the rapid type, digitalization is also necessary before surgery can be undertaken. It has been suggested from various sides that all patients with relative cardiac insufficiency (dyspnoea on exertion) should be digitalized before undergoing surgery. It has been claimed that such prophylactic treatment to some extent will reduce the incidence of post-operative complications (bronchopneumonia, phlebitis, thrombosis, and embolism), whereas the mortality does not seem to be affected.

Post-operative treatment of elderly cardiac patients is just as significant as pre-operative therapy. The treatment of shock, correction of salt and fluid balance, and the use of antibiotics and anticoagulants may come into consideration under these circumstances. The majority of the cases of myocardial infarction which occur post-operatively hardly represent coronary thrombosis or coronary embolism, but are more likely the result of myocardial anoxemia, since the loss of blood during surgery and the accumulation of blood in the abdominal veins may produce an insufficiency of the coronary circulation. Repeated blood transfusions are under such circumstances capable of eliminating this complication.

BOOK REVIEWS

WATER AND ELECTROLYTE METABOLISM IN RELATION TO AGE AND SEX, edited by G. E. W. Wolstenholme and Cecilia M. O'Connor, Ciba Foundation Colloquia on Ageing, vol. 4, Little Brown & Co., Boston, 1958, 327 pages, $8.50.

A volume of this nature—a symposium or as the editors prefer a "colloquium"—on a subject as broad as that chosen, is inherently difficult to review because of the diversity of subject matter and of points of view. A collection of opinions and factual data of a group of distinguished investigators in a field of such current interest is, of course, of great value to any student of the subject and the collective bibliography of the authors is in itself a great contribution.

The title is perhaps a little misleading because it is such an ambitious one. Even if one takes the point of view that aging begins with conception, which is, of course, a reasonable one, the lack of information on the deferescence of man's stay on earth or senescence, comes as a surprise and, for the reviewer, a disappointment. The great majority of the material has to do with growth, admittedly a phase of aging—and most of the rest with disease, except for N. W. Shock's and G. C. Kennedy's chapter on renal changes which do not yield exactly new information. H. Victor Parker's article is an effort to describe changes in body water compartments with age but the factor of the great variable in body composition, namely, adipose tissue, is treated so sparingly that the significance of the data on changes with age are subject to great doubt. It seems a pity that he did not include in his reference such pioneers in water content of the body in living man as Von Hevesy and Behnke.

A few differences in sex are brought out in body composition in Parker's material and in G. I. M. Sawyer's article concerning steroid changes with aging, but the bearing of their data on electrolyte metabolism is far from clear.

Many of the remarks in the discussion are vague and pointless, as usual. Although valuable at the time of discussion, the writer has often wondered whether the time and labor involved in publishing these discussions is worth the result, especially in view of the enormous volume of present scientific publications.

One or two statements in discussion appear to be so erroneous as to merit correction. Black, page 75, makes the statement that "the specific activity of the potassium in the saliva is two or three times that of the specific activity of potassium in the plasma at the same time." I assume that he really meant that the total radio activity, or counts per unit of time per gram of biological material, were different. If the specific activity of potassium in the two samples differed, the major assumption for the use of radio-active tracers would vanish.

Shock states (page 114) that "It seems to me that we have two possible interpretations of this age reduction in intracellular water. The interpretation I favour is that the reduction of *total* intracellular water is a reflection of the loss of functional cells—." "The reviewer cannot find any evidence in Parker's article for decrease in total intracellular water—only figures relative to body weight. The changes may as easily, therefore, reflect an increase in proportion of body fat.

On the whole, the volume is a very valuable compendium of current thinking about electrolyte balance and is, for this reason, quite helpful to those individuals interested in the subject.

J. MURRAY STEELE, M.D.
Goldwater Memorial Hospital
New York

DIETARY PREVENTION AND TREATMENT OF HEART DISEASES, by John W. Gofman, Alex V. Nichols, and E. Virginia Dobbin, G. P. Putnam's Sons, New York, 1958, 256 pages, $3.95.

On the basis of the modern concept of the unquestionable influence of the diet on the development of coronary atheromatosis and on the occurrence of coronary thrombosis, it is logical to attempt to achieve a reduction in the incidence of the disease and in the resulting mortality through dietary means. This contention constitutes a solid basis for the present publication. A brief account is first given of the nature of coronary disease with a special review of the role exerted by the lipoproteins, based on the fundamental studies by Gofman and his associates. The proposed diets understandably reflect the theories advanced by the authors, namely, that the consumption of fat influences the blood level of lipoproteins of the Sf 0-12 and 12-20 groups and that the intake of carbohydrates affects the Sf 20-100 and 100-400 lipoprotein fractions. The book contains a series of valuable tables listing the content of fat calories (with records of the percentages of low and high saturated fats), protein calories, and carbohydrate calories in various nutrients. In one section of the book suggestions are presented for meals with a low content of carbohydrates, and another chapter (61 pages) lists dishes prepared with vegetable oils. The reviewer considered the latter chapter of particular value in view of the experience accumulated during the last few years concerning the cholesterol-lowering effect of vegetable oils with a large content of unsaturated fatty acids.

TORBEN GEILL, M.D.
De Gamles By, Copenhagen

FAT CONSUMPTION AND CORONARY DISEASE: THE EVOLUTIONARY ANSWER TO THIS PROBLEM, by T. L. Cleave, Philosophical Library, New York, 1958, 40 pages, $2.50.

The author, a Surgeon Captain of the Royal Navy, reviews the available literature on the relation between fat consumption and coronary disease. His arguments reflect the current tendency to arrive at conclusions based on data on the total fat consumption without giving sufficient consideration to such factors as race, climate, occupation, and economic conditions.

According to the author, the high incidence of coronary disease is due to increasing industrialization and to a greater tendency among the population, particularly the urban population, toward the consumption of arbitrary meals and arbitrary food mixtures.

The author's solution to the problem is, in short, "Natural foods, individually desired." Consumption of chocolate, ice cream, cakes, and pastries should be greatly reduced or even prohibited.

The small monograph can be recommended to the readers as a contribution to the current discussion about the etiology of atheromatosis and possible means of its prevention.

TORBEN GEILL, M.D.
De Gamles By, Copenhagen

WHAT WE *DO* KNOW ABOUT HEART ATTACKS, by John W. Gofman, G. P. Putnam's Sons, New York, 1958, 180 pages, $3.50.

This book gives a popular account of the modern points of view concerning the relation of diet to coronary disease. The author emphasizes that there is a tremendous need for an intelligible explanation of the new developments and their meaning for the ultimate eradication of premature heart attacks. As recently as 1947 heart attacks were regarded as one of the inevitable consequences of growing old. During the past ten years, however, our knowledge of heart attacks and their etiology has accumulated so rapidly that there is a good possibility that heart disease may be the next major medical problem which will assume relative unimportance.

The factors responsible for the development of coronary disease are listed by the author as follows: genetic conditions, obesity, hypertension, improper diet, cigarette smoking, occupation, body type, degree of physical activity, hormonal balance, and the stress and strain of modern life.

One of the main chapters in the book deals with the plasma lipoproteins and their clinical significance. The author has arrived at an evaluation of the significance of the elevation of the lipoprotein plasma content through a determination of "the atherogenic index," which reflects the increase of one or more of the four main groups of lipoproteins: Sf 0-12, 12-20, 20-100, and 100-400. In subjects who exhibit an elevation of the two lower groups a diet with a low fat content is claimed to be able to effect a marked reduction, especially if the animal fats are replaced by vegetable oils with a high content of unsaturated fatty acids. This statement would seem to parallel the well-known observations by Keys, Ahrens, and Malmros about the cholesterol-reducing effect of the above-mentioned fatty acids. One statement by Gofman is of particular interest, namely, that fat consumption is without influence on the higher groups of lipoproteins, Sf 20-100 and 100-400, whereas a reduction of the carbohydrate intake will have a definite effect on the plasma level of these lipoprotein fractions.

The author emphasizes the prognostic value of the atherogenic index by showing a close correlation between the incidence of coronary occlusion predicted from lipoprotein determinations (or the atherogenic index) and cases actually measured from vital statistics. Separate chapters deal with the atherogenic index in cigarette smoking, obesity, and various occupations. The presently available data do not seem to indicate any explainable correlation between occupation and the index. In a final chapter the author lists a program for prevention of heart attacks.

Gofman's book constitutes an interesting contribution to research on atherosclerosis. Even though the determination of the blood lipoprotein value seems to possess a prognostic significance, which a simple determination of the serum cholesterol does not provide, lipoprotein determination must be considered as being too complicated and expensive as a routine hospital laboratory procedure. For scientific laboratories it may probably be considered as indispensable. Several excellent electron-microscopic pictures of various lipoprotein groups in human blood are included in the text.

TORBEN GEILL, M.D.
De Gamles By, Copenhagen

THE NEW CHEMOTHERAPY IN MENTAL ILLNESS, edited by Hirsch L. Gordon, Philosophical Library, New York, 1958, 762 pages, $12.00.

This timely volume constitutes an effort by the able editor to bring together in one reference book 119 of the most important articles recently published on the subject of tranquilizing medications. Following a brief but informative historical sketch by the editor and a statement by Dr. Morris Fishbein, the book presents complete reprinting of original papers classified into 4 parts: 1) General Surveys, 2) Clinical Experience (a) in Psychiatric Disease, 3) Clinical Experience (b) in Related Conditions and 4) Side Effects.

Thirty-one ataractic agents in use up until 1958 are classified according to their chemical nature into 6 groups—Rauwolfia, Phenothiazine, Azacyclonol, Mephenesin, Hydroxyzine and Benactyzine. Although all are mentioned in one or another place, the bulk of the articles concern themselves with reserpine and chlorpromazine (Thorazine), the substances most widely used.

The book possesses some cumbersome features which will trouble the average reader. No effort is made in this edition to collate material, hence there is much repetition and considerable overlapping. The table of contents in effect is but a listing of the many separate papers and there is no index, thus making it a yeoman's task to find specific references to particular diagnostic entities. Another serious shortcoming of the book's organization is the bibliography which is arranged by resource journals but without cross reference to the individual papers as they appear. It becomes a difficult chore, indeed, to find the date and the journal of publication for each article, although most appeared between 1955 and 1957.

A large assortment of mental conditions are considered with particular reference to their responsiveness to chemotherapy. The gerontologist will find intellectual nourishment in the 4 papers that deal with emotional disturbance, anxiety, agitation and excitement, senility and senile anxiety states in the aged. However, the discriminating reader will note with some dismay that the term senile is used indiscriminately and that there is revealed a paucity of effort to individualize the psychological needs of elderly patients.

Unfortunately, there seems to be a widespread tendency to produce books such as this volume represents—books that are in effect anthologies and which make no effort to present carefully evaluated and digested data in an instructive and readily assimilable form. This trend is disappointing to the busy researcher and practitioner already overwhelmed by the superabundance of scientific literature.

The book's greatest forte lies in its bringing together in one handy volume a group of significant articles that would be a time-consuming task to trace down individually.

It is especially worthwhile to call prospective readers' attention to the chapter by John T. Ferguson, What's New and Usable in the Chemical Treatment of Abnormal Behavior. This is an absorbing and critical paper that considers the promise and problems of chemotherapy with noteworthy practicality.

MAURICE E. LINDEN, M.D., Director
Division of Mental Health and
Assistant Professor of Psychiatry
University of Pennsylvania, Philadelphia

HORMONE PRODUCTION IN ENDOCRINE TUMOURS, edited by G. E. W. Wolstenholme and Maeve O'Connor, Ciba Foundation Colloquia on Endocrinology, vol. xii, Little, Brown & Co., Boston, 1958, 351 pages, $9.00.

This is the fortieth volume of the proceedings of the Ciba Foundation and the twelfth in the series of colloquia on endocrinology. However, it is the first volume which has really stressed biochemical studies of hormone production in endocrine tumors. The reason, of course, is that it has not been possible before to study these tumors at the biochemical level. The individuals who participated in these colloquia are, without a doubt, the leaders in their respective fields. In the reviewer's opinion, their respective papers could not be improved on for bringing one's knowledge up-to-date on the advances in understanding the questions of the autonomy and dependence of functioning endocrine tumors. It is obvious that biochemical techniques have advanced our knowledge of functional tumors, and the articles presented in these colloquia will give the reader current information as to how far this advance of our knowledge has proceeded. The reviewer has found this volume to be remarkably free of factual and typographical errors. If one could possibly pick out this volume's outstanding feature, it would be its up-to-date and stimulating review of the biosynthesis of steroids in hyperactive and tumor-bearing human glands by R. I. Dorfman.

THEODORE E. WEICHSELBAUM, Ph.D.
Associate Professor of Experimental Surgery
Washington University School of Medicine
St. Louis

VERHANDLUNGEN DER DEUTSCHEN GESELLSCHAFT FÜR KREISLAUFFORSCHUNG, BAND 24: DIE LEBENSWANDLUNGEN DER KREISLAUFORGANE IN ABHÄNGIGKEIT VON ALTER UND GESCHLECHT, by Rudolf Thauer, Dr. Dietrich Steinkopff Verlag, Darmstadt, 1958, 386 pages, paper bound, DM 50.

This publication consists of a series of papers dealing with anatomical, physiological, biochemical, and pathological cardiovascular subjects as related to age. The reports are concise and factual and contain numerous valuable observations, reflecting the current stage of German research in this field. Both the papers and the discussions are edited in a conservative and attractive way. The fact that the approaches to the problems and the employed methods in several instances differ from those employed by American scientists makes the information contained in the monograph of considerable value. The publication can therefore be greatly recommended.

JOHN E. KIRK, M.D.

BOOKS RECEIVED

Monographiae Biologicae, vol. 5, no. 2, *On Ageing and Old Age, Basic Problems and Historic Aspects of Gerontology and Geriatrics*, by M. D. Grmek, Uitgeverij Dr. W. Junk, Den Haag, 1958, pp. 59-162, 14 guilders, paper bound.

Research on Novocain Therapy in Old Age, in English translation, a collection of seven papers from *Die Therapiewoche*, 1956-1957, by Anna Aslan, C. I. Parhon, C. David, M. Bürger, F. H. Schulz, U. Köhler, and F. Mampel, 72 pages, Consultant Bureau, Inc., 227 West 17th St., New York 11, 1959, $12.50.

JOURNAL OF GERONTOLOGY

VOLUME 14, NUMBER 3
JULY, 1959

Section B

Psychological and Social Sciences, Social Welfare

Edited by

Robert J. Havighurst, Ph.D.
Bernice L. Neugarten, Ph.D.

General Information

THE JOURNAL OF GERONTOLOGY is a quarterly journal owned and published by Gerontological Society, Inc. It publishes original manuscripts and review articles dealing with or bearing on the problems of aging from the fields of natural and social sciences. Preference will be given to manuscripts containing observational data.

Gerontological Society, Inc. and the Editors accept no responsibility for the views and statements of the authors as published in their original communications.

SECTION B

INSTRUCTIONS TO CONTRIBUTORS

Lack of adherence to instructions may result in delay of publication.

1. Manuscripts for Section B should be addressed to Dr. Robert J. Havighurst or to Dr. Bernice L. Neugarten, University of Chicago, Judd Hall, Chicago 37, Illinois.
2. Papers should rarely exceed 20 typewritten pages, including tables and illustrations. They must be double spaced on white paper 8½" x 11" and submitted in duplicate.
3. A condensed title for running page headline, not to exceed forty letters and spaces should be supplied.
4. The author's academic degrees and the institution with which he is affiliated should be indicated on the title page.
5. Tables should be typed on separate sheets. Tabular matter in excess of 10% of the cost of composition and printing of the manuscript is to be at the expense of the authors.
6. Legends for illustrations should be typed (double space on separate sheets). Each plate must be arranged by the authors. Engraving charges in excess of 10% of the cost of composition and printing of the manuscript are to be at the expense of the authors. If illustrations are larger than the manuscript sheet size, small prints, as well as the original drawings, should be submitted with the manuscript to facilitate mailing to reviewers. The desired reduction of figures should be clearly indicated on the margin of the drawing. Drawings should be in India ink on white paper, and if background lines are used, they should be blue. All lettering should be done with a lettering guide large enough to give 2 mm. letters in the final Journal reduction. Maximum plate size is 5½" x 8" (if legends are to be included on the same page, the length should be correspondingly less). Final single column plate width is 2¾". The name of the author, the number of the figure, and an abbreviated title of the article should be written on the margin of each illustration. All illustrations should be packed carefully with cardboard to avoid damage in mailing. Photographs and original drawings will be returned to the authors only when requested within 30 days after publication of the paper.
7. Authors are requested to limit the use of footnotes.
8. Every paper should end with a brief summary in which the points established by the investigation are outlined.
9. For matters of editorial style (references, footnotes, tables, etc.) authors should refer to the Publication Manual published by The American Psychological Association, Inc., 1333 16th Street N.W., Washington 6, D.C.
10. Articles may be submitted to the JOURNAL in a foreign language, but if accepted must be translated at the responsibility and expense of the authors.
11. Reprint price list and order blank will be sent to author with galley proof.
12. Submission of a paper to this Journal is held to imply that it has not been published, is not under consideration for publication elsewhere, and, if accepted for the JOUPNAL OF GERONTOLOGY, is not to be published elsewhere (except as Society Proceedings) without permission from the JOURNAL OF GERONTOLOGY.
13. The JOURNAL OF GERONTOLOGY is not responsible for manuscripts or illustrations.

* * * *

Subscription prices beginning with volume 8, 1953: in the United States and Canada, $10.00 per volume; in other countries, $10.50 (the equivalent of $10.50 in U.S. currency on the day of transfer). Single copies of the JOURNAL are available at $2.50. Back issues, 1946-1949, are $6.00 a volume; 1950-1952 issues are $8.00 a volume, plus 50c postage to foreign countries. Checks should be made payable to the JOURNAL OF GERONTOLOGY. New subscriptions and renewals are entered to begin with the first issue of the current volume. Four weeks' notice is required for change of address.

Publication office is at 1712-24 Chouteau Ave., St. Louis, Missouri. Editorial Offices are at 660 South Kingshighway Blvd., St. Louis 10, Missouri, and Judd Hall, University of Chicago, Chicago 37, Illinois. All communications and remittances relating to subscriptions, back volumes, advertising, reprints, etc., should be directed to the office of the Editor-in-Chief, 660 South Kingshighway Blvd., St. Louis 10, Missouri.

Entered as second class matter at the post office of St. Louis, Missouri.

Copyright © 1959 by Gerontological Society, Inc. All rights in the JOURNAL OF GERONTOLOGY are reserved. No part may be reproduced in any form whatsoever without permission in writing from the JOURNAL, except by a reviewer who wishes to quote brief passages in connection with a review.

VOLUME 14, SECTION B JULY, 1959 NUMBER 3

CRITICAL FLICKER FREQUENCY AND SOME INTELLECTUAL FUNCTIONS IN OLD AGE*

ARMAND W. LORANGER, Ph.D.,† AND HENRYK MISIAK, Ph.D.
(Department of Psychology, Fordham University, New York, N. Y.)

Although experimental studies of critical flicker frequency (CFF) can be traced back over 100 years (10, 11), it is only during the last 15 years that there has been a decided shift of interest from the role of the retina to that of the brain in fusion of intermittent light (12, 18). The present experiment has evolved from developments in three areas of recent CFF research: the relationship to CFF of brain pathology, age, and intellectual functions.

Since 1942 more than 20 reports have appeared in the literature concerning the effects of brain lesions on CFF. These studies have involved a wide variety of neurological disorders. Despite the miscellaneous pathology, the differences in the locations of the lesions, and the different testing procedures employed, there is some uniformity in the findings. In the majority of studies the average CFF of groups with brain pathology is lower than the average CFF of normal control groups. Thus it is not surprising that CFF has been viewed as a potentially useful indicator of the integrity of the central nervous system (12, 18).

The finding of lowered CFF in brain lesions provides an interesting background against which the results of studies of age and CFF can be viewed. Misiak (15) determined the CFF of 319 persons aged 7–91 years, and found that CFF drops with age, this drop becoming significant in individuals after age 55. However, he observed a great deal of individual variability in this decline, finding some CFF's at age 82 as high as some at age 7, and some CFF's at age 7 as low as others at age 80. A more recent study by Coppinger (4) yielded similar findings and, in addition, established that the extent of the age decline in CFF was dependent upon the level of stimulus brightness. It may be that a major cause of the decline of CFF with age is degeneration of the visual neural pathways in the brain. Considerable data have been amassed showing the presence, in various degrees, of gross anatomical and vascular changes as well as histological alterations in the brains of elderly people (6, 19). If CFF is lowered in many cases of brain pathology, why not in these alterations in the cerebrum which are not uncommon in old age?

Several investigators have attempted to relate CFF to various cognitive functions. In patients recently recovered from a concussive type of head injury Halstead (8) found no correlation between CFF and a test of general intelligence, but described a *P* factor, which had loadings in CFF, in a tactual performance test and in two visual discrimination tests. In college students Tanner (20) reported a relationship between a test of intelligence and CFF as determined under certain stimulus conditions. In another college group Colgan (3) employed a light stimulus of a different nature and found no relationship. However, in a group of elderly subjects Colgan (2) obtained significant correlations between CFF and several measures of intellectual functioning. In psychiatric patients Landis and Hamwi (13) reported negative findings, and tended to view the significant correlations reported by Tanner and Colgan as examples of random fluctuation.

If there is a correlation between CFF and intellectual functions, it seems that the relationship should be evident in old age. Since one is more likely to encounter abnormal neurophysiology, there should be more pathologically-lowered CFFs in old age than at any other time of life. It also seems plausible that a reduced central neural efficiency in old age might adversely affect both CFF and some intellectual functions. The purpose of the present experiment was to test the following hypothesis: In old age there is a positive correlation between

* This investigation was supported by a research grant (M-1283) from the National Institute of Neurological Diseases and Blindness, U. S. Public Health Service.

† Now at New York Hospital, Westchester Division, White Plains, New York.

critical flicker frequency and measures of certain intellectual functions. It was thought that the present study might provide evidence of a neurophysiological correlate of some of the higher intellectual functions. Verification of the hypothesis would indicate the desirability of including CFF in longitudinal studies of aging in order to determine whether decline in CFF and decline in intellectual functioning proceed at a related rate in individuals as they grow older.

METHOD

Subjects. The subjects were 50 females between the ages of 74 and 80. The mean age was 77 years, and the median educational level was 9 years of schooling. All subjects were residents of homes for the aged in New York City, having lived in the homes an average of two and one-half years. The sample was drawn from eight homes, each of which has between 200 and 300 residents.[1] All female residents of these homes who were between 74 and 80 years of age and not seriously ill, infirm, or senile, presented themselves for a test of visual acuity and an ophthalmoscopic examination of the lens and fundus of the eye.[2] Subjects with no eye pathology were also given the Milton B. Jensen test for color-blindness. Of the 140 women examined by the ophthalmologist, 65 were eliminated from the study because they had bilateral eye pathology known to affect CFF. An additional 6 were excluded due to history of a disease known to affect CFF; while 19 others were excluded because of a language barrier, refusal to cooperate, and other miscellaneous reasons.

Administration of the Tests. The tests of intellectual functions in the order of their administration were: the Porteus Maze, the Wisconsin Card Sorting Test (WCST), the Raven Progressive Matrices, the Digit Symbol subtest of the Wechsler Adult Intelligence Scale (WAIS), and the Reasoning test of Thurstone's tests of Primary Mental Abilities (PMA). When the six-minute time limit on the PMA Reasoning test was reached, the subjects were given red pencils with which to complete the remaining items. In this way both timed and untimed scores were obtained. Only one test was given on any single day, with the exception that the Digit Symbol and PMA Reasoning were both given at the same testing session. The Porteus Maze and the Wisconsin Card Sorting were individually administered, while the Progressive Matrices, Digit Symbol, and PMA Reasoning were given individually or in groups of two or three subjects. Testing of each subject consumed a great deal of time, but in almost all cases it was completed within one month. As long as personal interest was shown the subjects, and time was taken to talk with them and reassure them, they proved to be very cooperative.

Scoring. The scores on the Porteus Maze are mental age scores, while those on the Progressive Matrices, PMA Reasoning, and Digit Symbol tests are raw scores. Split-half reliabilities were computed for the Progressive Matrices and the PMA Reasoning (Untimed). The reliability coefficients, according to the Spearman-Brown Prophecy Formula, were .91 and .93 respectively.

Five of the six scores from the WCST are measures commonly employed with this test (5). The sixth score, Error Percentage, was devised by the investigators, and consists of the total number of errors divided by the number of cards presented to the subject. The Card Sorting Test was terminated when the subject successfully completed 6 categories, or sorted 64 cards in succession without obtaining 10 successive correct responses. In order that complete and incomplete test results might give more comparable indices of performance, the Correct, Perseverative Errors, Non-Perseverative Errors, and Unique Errors were divided by the number of stages of the test which the subject completed. Since 11 subjects failed to complete any categories at all it was not possible for them to commit a perseverative error. The Perseverative Errors score is thus based on 39 subjects and not on the entire 50.

CFF Apparatus. The apparatus which was used to present the intermittent light stimulus and determine CFF was an electronic unit built by Ireland. A detailed description of a similar instrument (a later model) has appeared elsewhere (9). The light source consisted of a Sylvania glow modulator tube (R1131C) placed behind a circular milk glass test patch 12.5 mm. in diameter. The subject viewed the light monocularly through a 12.5 mm. aperture and a dark channel approximately 33 cm. in length. The visual angle subtended by the test patch was 2° 10′. A light-dark ratio of 1:1 was used.

[1] Appreciation is expressed to the superiors and sisters of the homes for the aged of the Carmelite Sisters and Little Sisters of the Poor in New York City for their cooperation in providing subjects for the present study.

[2] Dr. George McDonald performed the ophthalmological examinations.

The intensity of the light at the eye was approximately 8.5 millilamberts as measured with a Macbeth Illuminometer. When the method of constant stimuli was employed, an electrical timing unit controlled the 7 second light exposures and the 7 second intervening dark periods.

CFF Testing. In most studies of CFF the method of limits or just noticeable differences has been used to obtain individual CFF measures. However, the constant method is considered to be particularly superior for use with subjects who may not have a high capacity for prolonged attention, such as children and the aged. Ricciuti and Misiak (17) have described this testing procedure in detail. In this study the approximate CFF threshold was determined by gradually changing the light from flicker to fusion, and from fusion to flicker. Then the subject was randomly presented with six exposures of each of seven different light frequencies straddling her approximate threshold, as it is customary in the method of constant stimuli. Each subject's CFF was computed from her 42 judgments by means of Spearman's arithmetic method. The mean CFF of the 50 subjects was 38.18; the standard deviation was 3.09; and the range was 13.70.

RESULTS

To test the hypothesis of the study Pearson product-moment correlation coefficients were computed between CFF and each of the 11 scores obtained from the 5 tests of intellectual functions. Table 1 contains the intercorrelations of CFF, one measure from each of the 5 tests, and the added variables of age and education. The correlations of CFF with Digit Symbol, Raven Progressive Matrices, and PMA Reasoning (Untimed) are statistically significant. The other correlations with CFF which are not presented in Table 1 are: PMA Reasoning (Timed) .27 ($p < .05$); WCST Perseverative Errors −.54 ($p < .01$); WSCT Error Percentage −.29 ($p < .02$); WCST Non-Perseverative Errors .03; WCST Correct .02; and WCST Unique Errors .01. The r between CFF and WCST Perseverative Errors must be interpreted with caution since it is based on a truncated sample ($N = 39$).

TABLE 1. INTERCORRELATIONS ($N = 50$).

	1	2	3	4	5	6	7	8
1. CFF		.36	.17	.29	.32	.22	-.01	-.16
2. Digit Symbol			.55	.62	.47	.60	-.18	.23
3. Porteus Maze				.50	.68	.59	-.17	.23
4. PMA Reasoning (Untimed)					.64	.36	-.14	.33
5. Progressive Matrices						.65	-.34	.30
6. WCST: Categories Completed							-.16	.21
7. Age								.00
8. Education								

Note.—For 48 degrees of freedom and a one-tailed test of significance: .05 = .238, .01 = .329.

A multiple correlation (R) was computed to determine the maximum relationship between CFF and a composite measure of the various tests. The tests included in the battery were Digit Symbol, Progressive Matrices, Porteus Maze, PMA Reasoning (Untimed), and WCST Categories Completed. The R between the first three of these tests and CFF is .425, which is significant beyond the .05 level. When the Wherry correction for shrinkage is applied, R is .381, which is short of the .393 required for significance at the .05 level for 4 variables and 46 degrees of freedom.

To shed further light on the relationships of the variables in Table 1, the matrix of intercorrelations was factor analyzed by means of Thurstone's centroid method. Two criteria were applied to determine when to stop the extraction of factors. These criteria were: 1) no more than 1 per cent of the residuals should exceed the standard error of a zero r times 2.58; and 2) the criterion of McNemar (7). Only one significant factor could be extracted according to both of these criteria, although there was a tendency for a second factor to emerge. The factor loadings are presented in Table 2.

The one significant factor in the factor analysis is evidently a general cognitive one. It is of interest to note that the highest loading is in the Raven Progressive Matrices, a test which is reputedly highly saturated with Spearman's "g," and which correlates well with both verbal and non-verbal tests of intelligence (16). It is also noteworthy that CFF has a low but

TABLE 2. CENTROID FACTOR LOADINGS.

	I	II	h^2
Critical Flicker Frequency	.33	.43	.29
Digit Symbol	.76	29	.66
Porteus Maze	.75	-.14	.58
PMA Reasoning (Untimed)	.74	.25	.61
Raven Progressive Matrices	.86	-.28	.82
WCST: Categories Completed	.72	-.18	.55
Age	-.28	.12	.09
Education	.31	-.19	.13

significant loading on this general cognitive factor. The failure of the factor analysis to yield more than a single significant factor may be partly due to the small sample size and the limited number of variables employed, as well as the fact that all the tests of intellectual functions are non-verbal in nature.

DISCUSSION

The present findings of significant correlations between CFF and several tests of intellectual functions may be viewed as a corroboration of the earlier findings of Colgan (2). The fact that two independent studies using different psychometric instruments both have similar results strengthens the evidence for a relationship between CFF and intellectual functioning in the aged. It is also noteworthy that Colgan's sample consisted of 40 males as compared to the 50 females in the present study. The only test which the two studies have in common is the Digit Symbol. Colgan found a correlation of .39 between CFF and Digit Symbol, while in this study r was .36.

A priori, it would appear that the CFF decrement in old age might be due to the cumulative effect of the following factors: 1) the smaller diameter of the pupil in old age; 2) the elevation of the minimum light threshold due to anatomical changes in the optical and photochemical systems of the eye in old age; and 3) anatomical and histological changes in the neuroretina and higher visual pathways, i.e., the geniculocalcarine system and optic tracts. That pupillary size is not a major factor is demonstrated by the fact that there are large and significant differences between the CFF of young and old age groups, even when pupillary size is standardized by the use of artificial pupils (14). The artificial pupil makes observation of the stimulus more difficult and fatiguing for the elderly, and for this reason was not employed in the present study. However, the pupillary size of 35 of the 50 subjects was determined by photography under conditions of illumination approximating that of the CFF stimulus. The r between pupillary size and CFF was $-.28$, which is not significant, and in the opposite direction to that expected. The role of lenticular and retinal pathology was minimized by excluding from the study all subjects who showed any evidence of such pathology upon ophthalmoscopic examination. In fact, 80 per cent of the 50 subjects had 20/30 or better visual acuity with refraction or pin hole. The evidence suggests that any lowered CFF in the present old age group was most likely due in substantial part to neural factors.

Old people do comparatively well on tests of acquired information or "stored" knowledge, but have difficulty with tests that involve the comprehension of new ideas and the adoption of new work methods (1). This differential decline of intellectual abilities with age may be due to several factors. Tests of new learning usually involve meaningless materials whose content is remote from ordinary life experiences. A comparative lack of test sophistication and motivation, and the many years which have elapsed since the elderly have completed school, also may account for some of their poorer performance on tests requiring the application of a fresh method of thinking. However, it would seem unwise to neglect the possible role which cerebral deterioration may play in the poor performance of old people on certain mental tests. The tests selected for the present study, after a considerable study of all the available tests, were those on which the greatest age differences have been reported. Admittedly, the use of such tests may enhance any relationship between CFF and intellectual functioning in old age. The performance of the subjects on these tests will be discussed in another publication.

Both CFF and some intellectual abilities show comparable declines with age. If it can be assumed that central neural deterioration is one of the causes of the decline of some intellectual abilities with age, and also a factor in the decline of CFF with age, then the relationship between CFF and these intellectual functions becomes meaningful. However, in the absence of longitudinal measures, and in view of the conflicting evidence for a relationship between CFF and intellectual functions in younger age groups, such an interpretation can be considered only a tentative one. It is hoped that further studies currently being undertaken by the authors will clarify the meaning of the present findings.

SUMMARY

The present study tested the hypothesis that in old age there is a positive correlation between critical flicker frequency and measures of certain intellectual functions.

Fifty female residents of homes for the aged, all between the ages of 74 and 80 and all free

of eye pathology, neurological disorders, and senility, were given the following battery of tests: Critical flicker frequency, Porteus Maze, Wisconsin Card Sorting, Raven Progressive Matrices, Digit Symbol, and PMA Reasoning. These particular tests of mental abilities were selected because performance on them declines markedly with age. All tests of intellectual functions, except the Porteus Maze, correlated significantly with CFF. The relationship of CFF and intellectual functioning in the aged is tentatively ascribed to a reduced central neural efficiency in old age, which adversely affects both CFF and some intellectual functions.

REFERENCES

1. Brozek, J. Changes in sensory, motor, and intellective function with age. *Geriatrics*, 1951, **6**, 221-226.
2. Colgan, C. M. Critical flicker frequency, age, and intelligence. *Amer. J. Psychol.*, 1954, **67**, 711-714.
3. Colgan, C. M. The relation between critical flicker frequency and several psychological variables. Unpublished doctoral dissertation, University of Florida, University Microfilms, Ann Arbor, Mich., 1954, No. 9706.
4. Coppinger, N. W. The relationship between critical flicker frequency and chronologic age for varying levels of stimulus brightness. *J. Geront.*, 1955, **10**, 48-52.
5. Fey, Elizabeth T. The performance of young schizophrenics and young normals on the Wisconsin Card Sorting Test. *J. consult. Psychol.*, 1951, **15**, 311-319.
6. Foley, J. M. Hypertensive and arteriosclerotic vascular disease of the brain in the elderly. In J. E. Moore, H. H. Merritt, & R. J. Masselink (Eds.), *The neurologic and psychiatric aspects of the disorders of aging.* Baltimore: Williams & Wilkins, 1956. Pp. 171-197.
7. Fruchter, B. *Introduction to factor analysis.* New York: Van Nostrand, 1954.
8. Halstead, W. C. *Brain and intelligence.* Chicago: University of Chicago Press, 1947.
9. Ireland, F. H. Pulsed light measures flicker perception. *Electronics*, 1953, **27**, 189-191.
10. Landis, C. Something about flicker fusion. *Sci. mon.*, 1951, **73**, 308-314.
11. Landis, C. *An annotated bibliography of flicker fusion phenomena covering the period 1740-1952.* Ann Arbor, Mich.: Armed Forces National Research Council, Vision Committee Secretariat. University of Michigan, 1953.
12. Landis, C. Determinants of the critical flicker-fusion threshold. *Physiol. Rev.*, 1954, **34**, 259-286.
13. Landis C., & Hamwi, Violet. Critical flicker frequency, age, and intelligence. *Amer. J. Psychol.*, 1956, **69**, 459-461.
14. McCabe, F. J. The effect of light-dark ratio, age, and sex upon critical flicker frequency. Unpublished doctoral dissertation, Fordham University, 1954.
15. Misiak, H. The decrease of critical flicker frequency with age. *Science*, 1951, **113**, 551-552.
16. Raven, J. C. *Guide to using Progressive Matrices (1938).* London: H. K. Lewis, 1956.
17. Ricciuti, H. N., & Misiak, H. The application of the constant method in determining critical flicker frequency (CFF). *J. gen. Psychol.*, 1954, **51**, 213-219.
18. Simonson, E., & Brozek, J. Flicker fusion frequency: background and applications. *Physiol. Rev.*, 1952, **32**, 349-378.
19. Streicher, E. Physiological and anatomical changes in the central nervous system with age. In J. E. Anderson (Ed.), *Psychological aspects of aging.* Washington, D.C.: American Psychological Association, 1956. Pp. 94-96.
20. Tanner, W. P. A preliminary investigation of the relationship between visual fusion of intermittent light and intelligence. *Science*, 1950, **112**, 201-203.

CONSUMER PATTERNS OF AGED SPENDING UNITS*

SIDNEY GOLDSTEIN, Ph.D.
(Department of Sociology, Brown University, Providence, R. I.)

During the first half of the twentieth century the absolute and the relative numbers of aged persons in the American population have increased sharply. These changes in age structure have been accompanied by an increased interest in the social, economic, medical, and psychological aspects of the aging process. Such an interest stems not only from the sheer numbers of older persons, but also from the particularly unique position which most of these aged persons occupy with respect to such factors as labor force participation, income, housing, and medical services.

The low income position of the aged population is well recognized and documented (5). It is only recently, however, that data have become available which make it possible to ascertain the extent to which this income is sufficient to meet the current consumption expenditures of the aged, and the extent to which the aged differ from younger segments of the population with respect to the way in which they distribute their available funds among the various categories of consumer goods and services.

In the early part of 1951 the Bureau of Labor Statistics interviewed a national sample of some 12,500 family units representing all classes of consumers in urban areas of the United States (7). For purposes of the survey, the basic sampling unit was defined as a "consumer unit," which was either: 1) a family of two or more dependent on a common or pooled income for their major expenditures, and usually living in the same household; or 2) a person financially independent of any family group, living alone or in a household with others. In this analysis, the "consumer unit" is referred to as the "family," and therefore subsumes units of one person. In the survey, detailed information was obtained on family purchases of over 1,500 items of goods and services, on income, on savings, and on deficits in 1950. In addition the Bureau collected information on a number of social and economic characteristics of the spending units (8, Vol. 1, pp. v-xxxii). The Wharton School of Commerce is sponsoring a series of research monographs based upon these data which will cover the economic, marketing, and sociological aspects of consumer behavior in the United States (2). This paper presents some preliminary findings from one of these studies—a study concerned with the consumer behavior of the aged population.

FINDINGS

Consistent with the findings of other studies, the data from the Consumer Survey show that the income of older consumer units is far below that of all younger units in the population. As shown in Table 1, family units headed by persons between 65–75 years of age had incomes after taxes which averaged only $2,687; and those of units headed by persons 75 and over were even lower, only $2,161. By contrast, the average unit incomes after taxes of the age groups between 25 and 65 ranged between $3,850 and $4,500. Closely paralleling these age differences in average income level are the differences in the average amounts spent by units in each age group for total goods and services. Beginning with family units headed by persons under 25 years of age, the average expenditures for goods and services increased with each increasing age level, reaching a high in family units headed by persons 35–55 years of age. Thereafter, increasing age was associated with smaller average expenditures. The average amounts spent by families belonging to the 65 and over age groups were significantly below those of all other age levels.

Comparison of the data on expenditures with those on income shows that the aged, despite their markedly lower income level, were somewhat more successful than the groups under 55 in keeping their expenditures within their income limits. This does not necessarily indicate that the consumpton level of the aged is adequate, but rather (as supported by the data on savings), it suggests that the aged, unlike the younger groups, are by necessity living within the amounts available to them from money income.

* Revised version of a paper presented at the meetings of the Gerontological Society, Philadelphia, November, 1958.

Changes in assets and liabilities

In this study the amount of savings or dissavings is represented by the difference between net changes in assets and liabilities. As shown in Table 2, in 1950 all age groups headed by persons under 65 years of age experienced average increases in assets. By contrast, families in the two aged groups experienced net average decreases in assets, −$38 for the units in the 65–75 group and −$152 for those in the 75-and-over group. This is not surprising in view of the significantly lower average income of the older population as well as the often expressed function of savings as a source of money in old age. At the same time, the fact that a high percentage of older units have little or no assets (4, pp. 129-145), suggests that a number of such units may be forced either to seek other sources of funds in order to meet their current consumption needs or to lower their level of living.

The units in all age groups, on the average, went further into debt in the year 1950 by incurring obligations which were greater in amount than the repayments made on old ones. While all groups were alike in experiencing a net average increase in liabilities, the size of these increases differed by age level, being much higher for those under 65 than for those over 65. For the younger segments of the population this practice of incurring added debts represents a major means for obtaining goods and services which might be unobtainable if such purchases had to be restricted to the amount available from money income. At the same time, the ability to incur such liabilities enables these younger groups to continue the accumulation of assets. The situation for the aged is quite different; on the whole, they incur few new liabilities. This may stem from their inability to do so because of the poor financial risk they represent; it may result from the lack of need to incur new debts (for example, many already own a paid-up home); or it may result from the unwillingness to do so. Increased liabilities therefore represent a minor source of receipts upon which older persons draw to supplement money income.

The net result of changes in assets and liabilities, treated jointly, is synonymous with savings if the result is positive in direction. It is synonymous with dissavings if it is negative in direction. For all age groups under 65, as shown in Table 2, the net increases in liabilities exceeded net increases in assets. For the two groups over 65, net changes in assets and in liabilities were both negative in direction. For all age groups, therefore, the net results of changes in assets and liabilities were negative. However, the amount of such dissavings and the relation of this amount to money income varied signifi-

TABLE 1. AVERAGE INCOME, AVERAGE EXPENDITURE, AND EXPENDITURES FOR VARIOUS GOODS AND SERVICES: BY AGE OF HEAD OF HOUSEHOLD (*U. S.* URBAN POPULATION, 1950).

	Age of Head of Household						
	Under 25	25-35	35-45	45-55	55-65	65-75	75 and over
Average Income After Taxes	$3,050	$3,876	$4,464	$4,500	$3,850	$2,687	$2,161
Average Consumer Expenditure[a]	$3,142	$3,870	$4,360	$4,342	$3,657	$2,567	$2,076
	Distribution (by Per Cent)						
Food	27.6	28.8	29.8	29.4	30.3	31.5	32.3
Housing	15.0	15.3	15.0	15.9	16.0	19.2	22.7
Household Operations	3.3	4.3	4.7	4.6	4.8	5.1	7.8
Furnishings	8.9	8.0	7.4	6.2	5.8	5.4	3.9
Clothing	11.7	11.2	12.3	12.3	10.9	8.8	7.8
Transportation	16.6	14.7	12.7	13.2	13.5	11.9	9.4
Medical Care	4.5	4.7	4.8	5.1	5.7	7.0	6.9
Personal Care	2.2	2.2	2.3	2.3	2.3	2.1	1.8
Recreation	5.7	5.8	5.6	5.5	4.8	4.2	3.4
Miscellaneous[b]	4.5	5.0	5.5	5.2	5.9	4.9	4.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note.—Based on data found in 8, Vol. XVIII, p. 3.
[a] Does not include disbursements for either personal insurance or gifts and contributions.
[b] Includes expenditures for alcohol, tobacco, education, and miscellaneous.

cantly by age level. The relationship between the amounts dissaved and age is approximately U-shaped, with both the absolute and the relative amounts dissaved being greatest for the two youngest and the two oldest groups.

The similar patterns of relatively large dissavings by the young and the old were, however, attributable to different factors. On the one hand, the young experienced large increases in liabilities which were compensated to a great extent (almost 75 per cent) by large increases in assets. On the other hand, among the aged, decreases in assets were compounded by small increases in liabilities. The economic position of the aged was, therefore, quite different from that of the groups under 65. While the young were building up their assets and, at the same time and to and even greater extent, were increasing their financial obligations, the old were drawing upon their limited accumulated assets and to a small extent were also incurring financial debt. This different pattern of savings by the aged reflects their generally disadvantageous economic position.

The extent to which the economic resources of the aged are inadequate to insure a minimum standard of living is attested to by special tabulations made of the data available from the Survey of Consumer Expenditures. These show that almost one-third of the units in the 65-75 age group and almost one-half of the units in the 75-and-over group are experiencing substandard levels of existence. By contrast, only 12 to 20 per cent of the units in age groups headed by persons under 65 years of age were so classified. (An explanation of the basis on which units were classified as substandard is given by Snyder [31].)

TABLE 2. NET CHANGES IN ASSETS AND LIABILITIES: BY AGE OF HEAD OF HOUSEHOLD (U. S. URBAN POPULATION, 1950).

Age of Head of Household	Net Change In Assets	Net Change In Liabilities	Net Change in Assets and Liabilities	Net Change In Assets and Liabilities as Per Cent of Income
Under 25	$248	$401	$ - 153	- 5.0
25-35	347	471	- 124	- 3.2
35-45	345	374	- 29	- 0.7
45-55	79	137	- 58	- 1.3
55-65	187	223	- 36	- 0.9
65-75	- 38	60	- 98	- 3.6
75 and over	- 152	11	- 163	- 7.6

Note.—Based on data found in 8, Vol. XVIII, p. 2.

Expenditure for various goods and services

Because the total expenditure for current consumption of goods and services by aged units was significantly lower than that of age groups under 65, it is not surprising that the average outlays of the aged for particular categories of goods and services were likewise smaller. In order to determine the extent to which age influences consumer expenditures the analysis must therefore be in terms of the percentage of total expenditures devoted to particular categories of consumption rather than to the absolute amounts spent for each category. Expressed in these terms, the analysis shows that the consumer behavior of the aged population differs markedly from that of the younger. These data are presented in Table 1.

Food represents the largest single category of expenditure for every age group. The relative amount spent for food, however, bears a positive relationship to age, increasing from a low of 28 per cent for those families in which the age of the head of the household is under 25, to a high of 32 per cent among families in which the age of the head of the household is 65 and over. This suggests that among the aged a higher percentage of the funds available for all consumer goods and services is required for food purchases. This is consistent with the fact that low income groups (and a majority of the aged units are low-income) spend relatively more for food than do higher income groups (6, pp. 35, 51). As a result, less money is available among the aged for other types of goods and services.

Housing, which includes the cost of utilities, rates as the second largest expenditure category. As with food, increasing age level is associated with higher relative outlays for housing needs, in spite of the fact that the aged units have among the highest rates of home ownership of all groups. Housing, like food, represents a basic need, and again, it is probably for this reason that older units with limited incomes allocate relatively more of their available funds for such purposes than would be the case if their income were not so limited. The cost of household operation is also relatively greater for the aged.

Expenditures for furnishings display an inverse relationship to age, decreasing steadily with increasing age. This decline is at least partially attributable to changing needs associated with the life cycle. Beginning a household and forming a family necessitates the expenditure of

large sums. Increasing family and household size is associated with additional expenditures for furnishings, but not, generally, to the same extent as at the time of the initial formation of the household. Middle age and to an even greater extent old age may most frequently be associated with only occasional replacement of furnishings or the purchase of isolated items which are relatively new on the market, such as television sets.

Clothing expenditures show little variation among all groups under 65, but decrease for those over 65. The presence of growing children in a family undoubtedly constitutes an important factor in raising the clothing costs of the younger family units. Among the aged, on the other hand, both the absence of children and the savings achieved through wearing clothes for a longer time serve to reduce clothing costs.

Transportation represents still another consumer category in which the percentage of total expenditures by the aged is well below the amounts spent by younger groups. Several factors account for this: Fewer older persons own automobiles. As a result the aged expend less on the average for both the initial purchase and the later upkeep of automobiles. More important, perhaps, is the fact that the large reduction in the percentage of old persons in the labor force eliminates the need for these persons to travel to and from work, and thereby reduces their travel expenses. Furthermore, the fact that those older persons who do work tend to live closer to their place of employment than do younger persons would also reduce the travel costs of the aged. At the same time, of course, both physical handicaps and financial restrictions may preclude extensive pleasure trips by aged persons.

One of the major problem areas associated with an aging population is that of health. The high incidence of chronic disease in the older segments of the population (1, pp. 8-17), coupled with decreased ability to pay for medical attention, accounts for the seriousness of health problems of older persons. The heavier financial burden which health needs place on the aged is evidenced by their higher expenditures for medical care and service. Whether the amounts so spent were actually adequate to meet the health needs of the aged cannot be determined here. The data do show, however, that at a time when health needs are perhaps greatest and when money income is lowest, the aged groups have the lowest rate of participation in medical insurance plans. Between 69 and 71 per cent of the family units in the age range between 25 and 55 years reported expenditures for medical insurance; by contrast only 45 per cent of those in the 65–75 age group and only 31 per cent of those in the oldest age group reported payments for group insurance.

Expenditures for personal care include the costs of barber shop and beauty services as well as the cost of toilet articles and preparations. Despite the low percentage of expenditure in this category, the aged groups differ from the younger ones, expending considerably less for such purposes.

Recreation includes expenditures for reading materials and equipment such as radios and television, admission to places of entertainment, and expenses for hobbies and club memberships. One might suppose that expenditures for recreation should be relatively greater in old age, since many older persons no longer participate in the labor force and therefore have more leisure time than do younger individuals. To the contrary, however, families headed by older persons spend considerably less for recreation than do families headed by younger persons. These differences probably stem both from the financial inability of older units to pay for recreational items and services, and from the fact that the type of recreational activities engaged in by older persons do not require as large a financial cost as those pursued by younger persons.

Expenditures in selected income groups

Table 3 presents data on expenditure patterns by age within selected income groups. It will be seen that age differences persist at both low and high income levels. However, the differences tend to be much less marked and much less regular among the higher income levels than among the lower ones.

SUMMARY AND DISCUSSION

As measured in dollars and cents, the average amount spent by older units for the goods and services of everyday living is well below the amounts so spent by all other age groups. This is true of both total expenditures and of expenditures for each of the categories of goods and services examined here. The differences between the aged and the younger groups extend, however, beyond the actual amounts spent to

the manner in which they are distributed among the various items of consumption. Proportional expenditures for food, housing, household operations, and medical care become increasingly larger with the increasing age of the family head, especially after age 65. On the other hand, the relative size of expenditures for household furnishings, transportation, clothing, personal care, and recreation are lower among the aged as compared with the groups under 65.

These data, on the whole, suggest two possible major relationships between age level and expenditures. First, changes in stages of the life cycle result in changing needs for goods and services and these changes are reflected in differential patterns of expenditures among the various age segments. Second, because the average amount of money available for meeting consumer needs changes significantly as the family unit passes through the various stages of the life cycle, the way in which this money is allocated must be changed so as first to insure the satisfaction of the more essential needs and only secondarily to meet those needs (actual and felt) on which more money would ordinarily be spent if it were available. Neither factor operates to the total exclusion of the other, of course. In fact, while not fully ascertainable from the available data there are many indications that both factors are jointly responsible for the variations in the expenditure patterns among the different age groups. Of the two factors, to judge from the data shown in Table 3, income seems to be the more important. The data for the higher income group suggest that those older units who continue to have high incomes continue to follow their earlier patterns of consumption. Only when their income level is markedly reduced, with the resulting need to spend relatively more for the more essential categories of consumer goods and services, are older family units forced to make sharp changes in the patterns of expenditures to which they were accustomed. All of these interpretations require further research, preferably through longitudinal studies in which the actual changes

TABLE 3. PER CENTS OF EXPENDITURES FOR VARIOUS GOODS AND SERVICES: BY AGE OF HEAD OF HOUSEHOLD, AND BY SELECTED INCOME GROUPS (U. S. URBAN POPULATION, 1950).

	Age of Head of Household						
	Under 25	25-35	35-45	45-55	55-65	65-75	75 and over
Income Under $1,000							
Food	38.2	32.3	32.5	31.1	33.6	33.4	38.9
Housing	21.5	18.0	21.9	22.4	25.1	28.4	31.6
Household Operations	2.3	4.8	4.8	4.3	5.2	4.9	5.4
Furnishings	3.7	5.7	4.9	4.6	3.9	5.1	2.6
Clothing	8.8	11.9	10.4	8.1	5.9	4.9	4.1
Transportation	5.7	5.4	6.0	8.9	10.3	6.5	3.8
Medical Care	4.1	7.6	5.7	7.3	5.4	8.4	7.3
Personal Care	2.4	2.6	2.6	2.0	1.9	1.8	1.7
Recreation	4.7	4.7	4.8	2.7	3.3	2.9	2.1
Miscellaneous[a]	8.6	7.0	6.4	8.5	5.4	3.7	2.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Income of $4,000 — $5,000							
Food	25.1	27.7	30.6	29.2	30.1	30.2	32.3
Housing	13.1	14.8	14.5	15.1	15.4	16.4	15.0
Household Operations	3.4	4.3	3.8	4.3	4.2	5.2	4.7
Furnishings	12.4	8.5	7.1	6.8	6.4	5.5	5.9
Clothing	10.9	10.8	11.9	12.3	10.9	10.4	11.2
Transportation	18.4	16.1	13.5	13.3	14.5	12.9	11.3
Medical Care	4.6	5.0	4.7	4.9	5.7	6.8	7.4
Personal Care	1.9	2.1	2.3	2.3	2.3	2.4	2.0
Recreation	6.0	6.0	5.9	5.6	5.0	5.4	5.8
Miscellaneous[a]	4.2	4.7	5.7	6.2	5.5	4.8	4.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note.—Based on data found in 8, Vol. XVIII, p. 27.
[a] Includes expenditures for alcohol, tobacco, education, and miscellaneous.

which occur as family units pass through the life cycle can be more fully ascertained.

With increases in the income available to older units through expansion of social security coverage and payments and through increased participation in private pension systems, some of the economic pressures imposed on older units should be reduced. At the same time, the data analyzed here suggest that such relief could also be partially obtained by greater progress in providing older family units with adequate and cheaper housing and by bringing more older persons under the coverage of medical insurance plans. Older persons could then use a greater percentage of their limited incomes and assets to obtain some of the less essential goods and services.

REFERENCES

1. Brewster, Agnes W., & McCamman, Dorothy. *Health costs of the aged.* U. S. Department of Health, Education and Welfare Report No. 20. Washington, D. C.: U. S. Govt. Print. Off., 1956.
2. Friend, I., & Kravis, I. B. New light on the consumer market. *Harvard Business Rev.*, 1957, **35,** 105-116.
3. Snyder, Eleanor M. Validity of field survey data for low income groups. Paper read at Conference on Research on Income and Wealth, National Bureau of Economic Research, March 23-24, 1956.
4. Steiner, P. O., & Dorfman, R. *The economic status of the aged.* Berkeley: Univer. of California Press, 1957.
5. U. S. Congress, Committee on Labor and Public Welfare. Income and income maintenance. In *Studies of the aged and aging, III.* Washington, D. C.: U. S. Govt. Print. Off., 1957. Pp. 3-75.
6. U. S. Congress, Joint Committee on the Economic Report. *Characteristics of the low-income population and related federal programs.* Joint Committee Print, 84th Cong., 1st Sess. Washington, D. C.: U. S. Govt. Print. Off., 1955.
7. U. S. Department of Labor, Bureau of Labor Statistics. Consumer Expenditure Survey, 1950: field methods and purpose. *Month. Labor Rev.*, 1951, **72,** 56-57.
8. Wharton School of Finance and Commerce. *Study of Consumer Expenditures, Incomes, and Savings: 1950.* Vols. I-XVIII. Philadelphia: Univer. of Pennsylvania, 1956.

IS AGE KINDER TO THE INITIALLY MORE ABLE?

WILLIAM A. OWENS, JR., Ph.D.
(Department of Psychology, Iowa State College, Ames)

It has apparently become a rather generally accepted view that individual differences in mental test performance tend to increase from about age 20 to age 60. Anastasi and Foley, for example, who have reviewed the work of Miles and Miles, Jones and Conrad, and Wechsler, state that "variability . . . tended to increase with age despite the decline in average scores" (1, p. 284). They go on to interpret: "It would seem that, as the individual's experiential background is enriched with age, more sources of variation in behavior are introduced and individual differences continue to increase" (1, p. 285).

It is easy to infer from such a statement that individual differences must have increased *because* age was kinder to the initially more able subjects than to the initially less able. Figure 1 shows that this interpretation is not the only possible one. An increase in variability could as well be attributed to a few atypical gains and losses at *all* initial ability levels (Fig. 1A) as to a differential effect by levels, whereby larger gains, or smaller losses, occur at higher than at lower levels (Fig. 1B). Actually, of course, the pattern of changes is impossible to determine from a cross-sectional study. It therefore seems that longitudinal evidence may be examined with profit.

Elsewhere Owens (6) has described in detail an investigation in which 127 males who took Army Alpha, Form 6, as a college entrance examination in 1919 were retested during 1950. In this study he observed substantial test-retest consistency ($r_{t\text{-}r} = .77$), accompanied by a relatively small total score increase in variability significant at the 5 per cent level.

The purpose of the present paper is to present a new analysis of certain of Owens' original data, as they relate to the definition of the *nature* of the observed increase in individual differences. The specific null hypothesis, to be tested in several ways, is that age is *not* kinder to the initially more able than to the initially less able.

METHODS

Three general methods were employed. The first was to compare the shifts from 1919 to 1950 in total Alpha scores obtained by subjects in each of five initial-score groups. The second, intended to maximize contrasts, was to compare the initial-score sub-test means for two extreme groups. One of these groups was composed of all the subjects who had lower retest than initial total scores; the other group was composed of an identical number ($N = 17$) of those subjects who had most improved their scores over the 30-year period. The third method was to apply Garside's formula (4) for estimating the regression of true gains upon fallible initial scores to the data for each of the eight sub-tests and to their total.

All analyses were based upon three sets of scores: the 1919 sub-test and total scores in T-score form; a comparable set of 1950 scores; and a resulting set of difference (D) scores (1950-1919). All T-scores were obtained by referring a given raw score to a normalized reference distribution of 1,000 cases. In some instances a specified constant was added to a difference (D) score distribution in order to make all values positive.

The data were treated by analysis of variance and linear regression.

RESULTS

The relationship between mean difference (D) score and level of initial total scores may be observed in Table 1. It is interesting to note that there is not even an apparent tendency for the larger gains, or smaller losses, to occur at the top rather than at the bottom of the distribution of initial scores. The obtained value of F is insignificant; the null hypothesis cannot be rejected; and it must be concluded that this appraisal contains no evidence of differential effects of age by initial ability level.

The results of a comparison of the initial subtest means of high gain vs. loss groups appear in Table 2. Here it should be observed that only one F value approaches the lower level of significance, and that this one indicates that the group that failed to improved their scores on Disarranged Sentences between 1919 and 1950 actually had the higher initial scores. Again, the only evidence as to the differential effects

of age by initial ability level reverses the usual assumption and fails to refute the present hypothesis.

Table 3 contains the data relating to the regressions of true gains upon obtained initial scores. The precise magnitudes of entries in columns five and six of Table 3 should probably not be accepted at face value, since the odd-even reliability estimates (rinitial-initial, odd vs. even) are somewhat inflated due to speeding, and the test-retest estimates (rinitial-final) are depressed by the differential effects of age upon individuals over the 30-year period involved. When Garside's formula (which appears below Table 3) is used, both errors tend to inflate the magnitudes of the negative relationships obtained. Since corresponding assumptions of the method have been violated, the application of a precise test of significance seems unwarranted. A crude and approximate over-all test of the hypothesis that the correlations of column six differ significantly from zero would be as follows: If they were perfectly positively correlated they would have a single value, best estimated from their mean, $r = -0.29$, which is significant above the 1 per cent level. Since the considerable variability among them indicates that they are *not* highly correlated, it is even less likely that by pure chance they would all be negative and of the given magni-

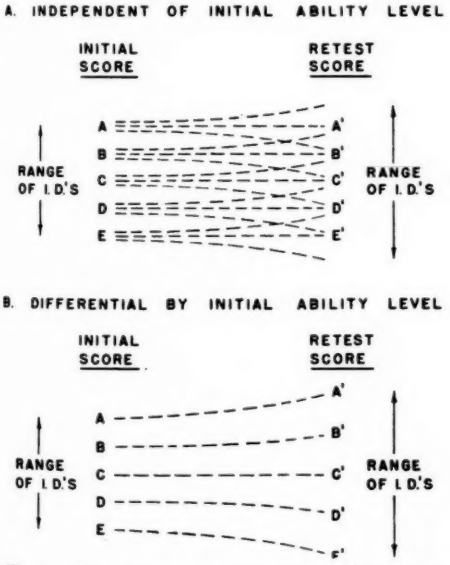


Fig. 1. Two patterns of increasing individual differences.

TABLE 1. MEAN DIFFERENCE (D) SCORES BY LEVELS OF INITIAL TOTAL SCORE.

Group	Initial Total Scores				
	I	II	III	IV	V
Score	113-	114-128	129-141	142-156	157+
N	27	26	24	25	25
MnD Score ($\sigma = 1.00$)	0.65	0.59	0.39	0.67	0.42
St. Err. of Mn.	0.084	0.098	0.142	0.112	0.139
$F = 1.37$[a]					

[a] Not statistically significant.

TABLE 2. COMPARISON OF INITIAL SUB-TEST MEANS FOR HIGH GAIN AND LOSS GROUPS.

Subtest	Group Scoring Higher in 1919	F	Significance Levels for F	
			1 per cent	5 per cent
Arithmetical Problems	High Gain	2.79	6.76 [a]	3.89 [a]
Disarranged Sentences	Loss	10.1	17.40 [b]	12.84 [b]
Analogies	Loss	3.67		
Information	Loss	2.18		

[a] Conventional estimate of error variances.
[b] Scheffe's conservative estimate for present "post-mortem" case (5).

TABLE 3. REGRESSION OF TRUE GAIN, OR D SCORES, ON FALLIBLE INITIAL SCORES (N=127).

Subtest	σ_i (1)	σ_f (2)	r_{if} (3)	r_{ii} (4)	b_{gi} (5)	r_{gi} (6)
1. Following Directions	.89	.92	.30	.49	—0.18	—0.15
2. Arith. Probs.	.90	.96	.69	.77	—0.03	—0.04
3. Practical Judgment	.81	.77	.56	.93	—0.40	—0.44
4. Synonym-Antonym	.89	.87	.64	.93	—0.41	—0.49
5. Disarranged Sentences	1.06	.82	.48	.87	—0.50	—0.54
6. Number Series Completion	.93	.84	.62	.76	—0.20	—0.24
7. Analogies	.71	.93	.56	.97	—0.24	—0.21
8. Information	.72	.67	.63	.73	—0.14	—0.17
Total	.77	.86	.77	.98	—0.12	—0.17

Note.—These data (5 & 6) were derived by utilizing Garside's formula: $b_{gi} = \frac{\sigma_f r_{if} - \sigma_i r_{ii}}{\sigma_i}$, where i = initial; f = final; g = gain, or D score.

tude. In view of the degree of disharmony between the data and the assumptions of the method, it is probably wisest to interpret this evidence as indicating only that the probability appears quite remote that the true mean correlation of gain with initial scores is positive.

DISCUSSION

In evaluating these results three methodological problems immediately arise. First, Army Alpha is not an extremely difficult test for college students, and some of those who made high initial scores almost undoubtedly encountered sub-test ceilings on retesting. Thus, in Table 1, the subjects of Group V made next to the smallest apparent mean gain. On the other hand, the subjects of Group I were some distance from the sub-test floors, so that they might well have accounted for the smallest gains (actually losses) if the theory of differential effects by initial level were correct. That they conspicuously failed to do this is clearly indicated in the table.

Second, it might be argued that the present subjects were a group too homogeneous to reveal differential effects, since all were prospective college students. That some selection did exist is undeniable. It is, nevertheless, interesting to note that the standard deviation of total Alpha scores in the present sample is over two-thirds as large as the one reported by Bingham (2, p. 331) for literate, native, white soldiers of World War I. The writer is disposed to feel that this amount of restriction in range could hardly be thought of as sufficient to prevent the exhibition of differential effects actually present.

Third, it could be objected that the operation of retesting resulted in the selection of a group of subjects possessing superior initial scores, relative to the complete roster of candidates; and thus disposed by regression to show an atypically large number of low gain or D scores at higher levels of initial score. A slight bias of this sort does, in fact, exist, since the mean T-score of 201 potential testees was 5.50 and that of 127 actual testees was 5.67. This bias is, however, so slight that it could lead only to the finding of a less conclusive negative relationship between initial score and gain, and not to the finding of a positive relationship.

For the moment, then, let us assume that the basic data and analysis are reasonably valid. If they are, what interpretation is suggested? An earlier study by the writer (6) indicated that, in the present sample, individual differences in total Alpha score tended to persist, and to increase slightly but significantly between the years 1919 and 1950; yet the present analysis, conservatively viewed, seems to indicate that this increase was *not* attributable to differentially large gains at initially higher ability levels. It seems, therefore, that individual differences must have increased as they did because approximately comparable increments and decrements in performance occurred at all levels of initial ability.

If this is the case, a pertinent question remains: Upon what sub-tests did those who markedly improved their performance show this improvement? Or, conversely, upon what sub-tests did those who failed to improve their performances show decrements? Some relevant data appear in Figure 2. It seems noteworthy that performance on the Analogies sub-test apparently contributed a disproportionately large part of the total score decrement of the "loss" group. Conversely, the "high gain" group appeared to show disproportionate increments on the verbal and informational sub-tests; Synonym-Antonym, Disarranged Sentences, and Information. Such observations are in accord with the findings of previous investigators such as Foulds and Raven (3), and have interesting implications for the potential psychometric diagnosis of intellectual aging.

INTERPRETATION

In broad perspective, the present data seem to indicate that intellectual increments and decrements, with age, occur in persons of all initial ability levels. The central question which remains is one relative to etiology.

Since the outstanding gains of those who gained most were in verbal and informational areas, two corresponding explanations suggest themselves. First, the writer (3) has previously reported much larger gains on the Disarranged Sentences test for subjects who came to college from rural areas than for subjects who came from urban areas. Initial scores were lower for the rural group, but final scores were comparable; thus suggesting the ultimate alleviation of some early, environmentally-conditioned language handicap. These outstanding gains could then be a matter of overcoming a deficit. Second, in the informational area, one may reason that improvement is dependent upon exposure to new information and upon ability and desire

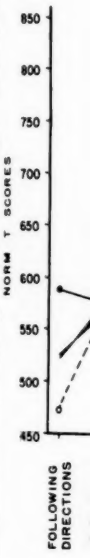


Fig. 2. D

to retain it. Again, the writer (3) has previously indicated that subjects who reported four or more hobbies and/or recreational activities improved their scores most between testing and retesting. Perhaps hobbies and recreational activities provide some of the needed intellectual stimulation. With regard to retention, the present data seem to warrant only a statement to the effect that retention must have been fairly adequate in the "high gain" group.

The losses of the low gain group were most apparent on the Analogies test. Here also, the writer (3) has previously reported that gains vary significantly with amount of educatior subsequent to initial testing. Thus, the subjects who did relatively poorly on the retest may have been longer and more continuously away from formal or informal education than their fellows. On the other hand, it must be admitted that the observed losses may have been conditioned by subtle, and as yet largely unspecified, physiological changes.

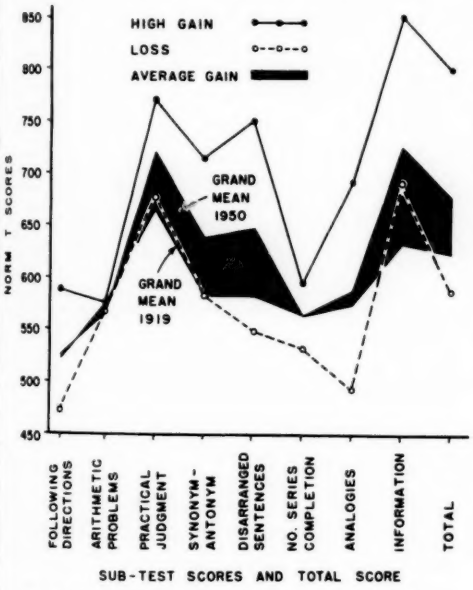


Fig. 2. Differential patterns of retest gains and losses.

The findings of this study contain disquieting implications for those who maintain that the advancement if not the very survival of our culture is clearly dependent upon the efforts of our most talented citizens. Thus far, it has been a rather generally accepted view that age is kinder to these gifted few. The present results, on the other hand, suggest that this is not the case, and that increments and decrements in test scores from age 20 to age 50 are roughly comparable at all levels of initial ability. This study affords no evidence as to what relationships exist after age 50. However, if the situation after 50 is comparable, then clearly there is need for research directed at determining how the abilities of the most able may be preserved or improved.

REFERENCES

1. Anastasi, Anne, & Foley, J. F., Jr. *Differential psychology.* New York: Macmillan, 1949.
2. Bingham, W. V. *Aptitudes and aptitude testing.* New York: Harper, 1937.
3. Foulds, G. A., & Raven, J. C. Normal changes in the mental abilities of adults as age advances. *J. ment Sci.,* 1948, **94,** 133-142.
4. Garside, R. F. The regression of gain upon initial scores. *Psychometrika,* 1956, **21,** 67-77.
5. McHugh, R. B., & Ellis, D. S. The "post-mortem" testing of experimental comparisons. *Psychol. Bull.,* 1955, **52,** 425-428.
6. Owens, W. A., Jr. Age and mental abilities: a longitudinal study. *Genet. Psychol. Monogr.,* 1953, **48,** 3-54.

INFORMAL GROUPS AND INSTITUTIONAL ADJUSTMENT IN A CATHOLIC HOME FOR THE AGING*

SISTER M. ANN AMEN, S.S.J.
(Villa Maria College, Erie, Pennsylvania)

This paper is based upon an empirical study of 120 residents of a Catholic home for the aging in an eastern city of approximately 150,000 population.

THE PROBLEM AND HYPOTHESES

The purpose of the study was to discover the kinds of informal groups in the home, the extent to which the residents participate in such groups, and the relationship of group membership to institutional adjustment. Seven hypotheses were advanced:

1. There is a positive relationship between satisfactory adjustment to the home and the degree and kind of participation in informal groups within the home.

2. Informal group participation varies according to age, marital status, sex, economic status, education, membership in voluntary formal organizations, number of close friends and relatives in the area, former occupation, and length of residence in the home.

3. Informal group membership in the home is based to a greater extent upon proximity of participants' rooms than on any other factor.

4. Individuals who were friends prior to residing in the home tend to become members of the same groups.

5. Those living in the home by choice participate more frequently in informal groups than those who entered the home involuntarily.

6. Participation in religious activities increases, rather than decreases, after an individual enters the home.

7. Leaders in the home are those residents who are best adjusted to living in the home.

THE SETTING

The home, which has been operating for seventy years, is located on a national highway about two miles from the downtown business district. There is direct and frequent bus service to the main shopping center. A fairly large shopping area is located within three blocks and a branch of the public library, a large Catholic church, and a league baseball field are nearby. Landscaped grounds surround the home, which afford opportunity for outdoor activities, both for the individual and for groups. The home, which accommodates the largest number of aging residents in the area, is for the physically fit and does not take care of the chronically ill or of convalescents. Residents are quite mobile and are not restricted to any area within the home. There are eight sections in which residents' rooms are located; six occupied by women and two, by men. Segregation of the sexes is also characteristic of the dining rooms and of the chapel but not of the recreation room on the first floor. The home was established to take care of the needs of the older people within the diocese and most of the residents are still living close to relatives and friends. A geriatric hospital built in 1957 adjoins the home and is part of the same physical plant.

METHOD

Definition of terms. In this study "informal group" is defined as two or more individuals who, though lacking formal organization, meet frequently for some specific purpose. "Institutional adjustment" is the degree to which the individual has been able to adapt himself to the living arrangements of the home. Although "the aging" is a relative term, it refers to all the residents since they are above the generally accepted retirement age of 65 years. "Social isolate" as used in this study applies to any individual who, in answer to two specific questions, was not named by other residents in the home as one of their three best friends or as a frequent associate. "Leaders" were those residents most frequently chosen as friends and/or associates by other residents. "Representatives" were those residents most frequently chosen to represent the home on a radio broadcast.

* The present paper is a summary of a Ph.D. dissertation submitted to the School of Social Science of the Catholic University of America, Washington, D.C. The author wishes to acknowledge her indebtedness to Dr. Thomas J. Harte, C.Ss.R., who directed the dissertation, and to Dr. C. J. Nuesse and Dr. Alphonse Clemens for their assistance.

Techniques. Techniques used in this study included (a) personal interviews with residents and with staff members, (b) participant observation over a period of four months, (c) a rating scale used to determine each resident's adjustment to the home, and (d) a sociometric test given to gain deeper insight into the interpersonal relationships of the residents. Prior to the beginning of the interviews, much valuable information was secured from office records and from informal conferences with members of the staff. Since the investigator lived at the home during part of the study, she had an opportunity to observe the activities of the residents from early morning until late at night.

Informal groups were categorized into three levels of group participation: those implying a high degree of social interaction (groups that formed for conversation and visiting back and forth, groups who went on walks or went shopping together); those implying a medium degree (card-playing groups, volunteer work groups, and hobby groups); and those implying a minimal degree (radio-listening and television-viewing groups). This arbitrary division was determined largely by the amount of verbal communication and the degree of intimacy involved in each category.

Each resident was rated on his adjustment to the home by the director of the home, by the staff member in charge of the dining rooms, by the staff member in charge of his floor, and by the investigator. The judges, who were given individual rating sheets and an explanatory key to the categories, checked one of the following five classifications for each resident: "very well adjusted" (rated "5"), "well adjusted," "adjusted most of the time," "poorly adjusted," and "maladjusted."

For the purpose of studying interpersonal relationships in the population, each resident was asked to name his three closest friends at the home and anyone else at the home with whom he associated frequently. On the basis of these data the investigator selected categories of choice, and the same general typology of isolates, intimates and leaders used by Burgess in his study of Moosehaven residents (1).

The investigator was able to secure sufficient data to classify the residents into three levels of economic status. Residents who came to the home with assets of $10,000 or more, or who had a regular income in excess of their ordinary current expenses and additional assets of at least $5,000, were placed in the high economic status category. Residents who came to the home with assets of $5,000 to $9,999, or who had a regular income in excess of their ordinary current expenses and additional assets of $2,000 to $4,999, were placed in the middle category. All others were placed in the low economic category.

Residents were classified into three broad groupings on the basis of kinship interaction. The frequency and extent of visits with relatives, the frequency of telephone "visits," and the extent of correspondence between the resident and his relatives were given weighted scores to classify residents who were below average, average, or above average in kinship interaction.

During the course of the investigation all but one of the 121 residents were interviewed. The exception was a newly-arrived resident who refused to cooperate in the study. The characteristics of the population are given in Table 1.

TABLE 1. CHARACTERISTICS OF THE POPULATION (N = 120).

Characteristics	Males (N = 30)	Females (N = 90)	Total (N = 120)
Age			
65-69 years	1	10	11
70-75 years	10	28	38
76-79 years	5	19	24
80-85 years	9	24	33
86-89 years	4	8	12
90-94 years	1	1	2
Marital status			
Widowed	23	50	73
Single	5	35	40
Separated	2	4	6
Divorced	0	1	1
Occupation[a]			
Professional and managerial	7	19	26
Skilled	8	16	24
Service	1	22	23
Clerical and sales	6	14	20
Semiskilled	1	14	15
Unskilled	5	2	7
Agriculture	2	3	5
Education			
Under 7 years	13	19	32
7-9 years	13	35	48
10-12 years	3	28	31
Over 12 years	1	8	9
Religious affiliation			
Catholic	29	79	108
Non-Catholic	1	11	12
Place of birth			
Native-born	23	72	95
Foreign-born	7	18	25
Non-voluntary admissions	1	3	4
Employed	0	9	9

[a] Occupations of the husbands were used for married women except in five cases where the husband's occupation was unknown. In these cases the wife's occupation was used.

FINDINGS

Group participation. Informal groups in the home varied in size from dyads to an eighteen-member television-viewing group. With the exception of six groups composed of men and women, the groups were made up of either male or female residents exclusively. The segregation of the sexes was indicated by the complete lack of opposite sex choices as friends or associates. There was little difference between the sexes in the number of spectator and solitary activities in which they engaged.

Compared to the total home population, social isolates had a higher percentage of both men and women who did not attend the movies or watch television, whereas leaders had a higher percentage who attended both the movies and watched television. Apparently television-viewing was something more than a solitary activity since most residents who had television sets in their own rooms preferred to watch the evening programs in the recreation rooms where they could be "with the others." It was observed also that in most cases residents came in small groups rather than singly to the recreation rooms to watch the television programs.

Most of the informal groups were in the category of high social interaction groups with "visiting" groups accounting for the greatest number in this classification. In the majority of cases there was an overlapping of memberships in informal groups. There was a consistent pattern in group memberships: the high social interaction groups were composed of persons having the highest average number of memberships, and the low social interaction groups were composed of persons having the lowest.

The residents who participated in informal groups outside the home ranged from those who were very well adjusted to the home to those who ranked relatively low on the adjustment scale. In the majority of cases these groups predated the resident's entrance to the home and reflected earlier life-patterns rather than an attempt on the part of the resident to seek satisfactory social relations outside because they were unavailable within the home.

There was a considerable amount of social interaction involving the residents and their relatives and friends. This differs from the findings of Orbach and Shaw (4) who noted that there were relatively few family and kinship interactions among those they interviewed, and from Cavan's study (2) in which it was found that 94 per cent of the institutionalized women studied lived without close family contacts. Only 13 residents did not receive visits from relatives; of this number, 5 made periodic visits to their relatives, and 5 others had no living relatives. When a Chi square test was used to determine if any relationship existed between the frequency of kinship interaction and the adjustment ratings of the residents, the relationship was found to be significant at about the .03 level.

Fewer residents received visits from friends than from relatives, although 61 per cent indicated they had friends who came to visit them at the home. Residents also developed a visiting pattern with the patients from the geriatric hospital, and ambulatory patients were regular participants of informal groups in the home.

Sociometric data. Data from the sociometric test showed that the majority of 19 isolates were aware of their social isolation (bilateral isolation), which confirms a finding by Burgess (1). Some social isolates were actually, however, members of informal groups within the home. The section of the home which had the highest percentage of female residents choosing two or more intimates (reciprocal choices of friends and/or associates) had no social isolates. The highest proportion of social isolates came from the section that was the most physically isolated; and the highest proportion of leaders came from the section that was the least physically isolated. Leaders tended to choose other leaders as intimates and most of these choices were intra-sectional choices. The same situation existed in the choice of representatives, with representatives choosing one another and the majority of the choices being intra-sectional. Two-thirds of the leaders were also chosen as representatives of the home.

Leaders averaged 14.2 memberships in informal groups as compared with 6.7 memberships for the average resident. Eight of the leaders were among the 12 residents most frequently chosen to represent the home on a radio broadcast. Leaders participated in informal groups more frequently, their economic status was higher, and they attended religious group activities more frequently than the general home population. Whereas the residents in the low economic status category were seldom chosen as leaders or representatives of the home, their

economic status did not preclude their becoming the best adjusted to the home.

Factors in adjustment. On the basis of the judges' ratings, the residents ranged from 5.0 (a unanimous rating of "very well adjusted") to 1.75, with approximately half the residents being rated 4.5 and above, indicating that the home population was generally well adjusted. A high percentage of the high economic status residents was found in the better adjusted category and a high percentage of those in the low economic status classification was found in the less well adjusted class.

The average length of residence for the very well adjusted residents was 79.3 months as compared with 28.8 months for the least well adjusted. When the entire population was equally divided into the better adjusted and the less well adjusted, it was found that the former averaged 60.0 months of residence as compared with 55.9 months for the latter.

Daily participation in religious group activities was more characteristic of the better adjusted than of the less well adjusted residents.

Chen (3) found that many aged persons can get along satisfactorily in institutions when they cannot get along at home; and this was confirmed in the present study. It was found that in the majority of those cases where the resident stated he could not live with his children satisfactorily, he was rated among the well adjusted at the home. From data secured in the interviews and from observation, it appeared that in most cases the kinship relationship improved after the resident entered the home.

Staff-resident relationships seemed to be an important factor in the satisfactory adjustment of the individual to the home. This was shown by the fact that the work, attitude, and treatment of the Sisters ranked second only to presence of the chapel as the most important factor in the maintenance of high morale among the residents as was indicated by their listing of factors in morale. Nineteen residents had close relatives in the religious community that operates the home and nine others had close relatives who were members of religious communities or who were diocesan priests. It is possible that such ties may give the residents a greater sense of security and feelings of kinship with the staff, and may make their adjustment to the home easier.

The age, length of residence, and nationality backgrounds of the staff members in charge of the various floors may have played an important part in the social adjustment of some residents. All these staff members had lived at the home longer than most of the residents and had been responsible for orienting the residents to the home. It was observed also that the presence of older persons on the staff inspired respect and confidence. The majority of the residents had either German or Irish nationality backgrounds. The fact that the Sister in charge of one of the floors was born in Ireland and another one was born in Germany may have been significant in the adjustment of some residents. Some of them conversed with the German-born Sister in her native tongue, and several of the residents with an Irish background were eager to call the attention of the interviewer to the fact that "their Sister" was from the "old country." To what extent these factors may have helped in the adjustment of the residents to the home, it is impossible to determine from the present study but it is possible that such intangibles as these play a more important role in institutional adjustment than is generally recognized.

The hypotheses. With respect to the hypotheses stated earlier, the findings were:

1. A high proportion of the poorly adjusted residents belonged to four informal groups or less, and a high proportion of the well adjusted residents belonged to from 10 to 24 informal groups. (On the basis of a Chi square test the relationship between memberships in informal groups and the adjustment rating of the residents appeared to be significant at the .02 level.) Very well adjusted residents were above the average in number of memberships in high social interaction groups and below the average in memberships in the medium and low social interaction groups. Those who rated lowest on the adjustment scale had fewer than average memberships in the high and medium social interaction groups, but many more than average number of memberships in the low social interaction groups. Very well adjusted residents averaged memberships in 8.8 informal groups as compared with an average of 2.7 informal groups for the least well adjusted.

2. Table 2 shows the relationships between number of memberships in informal groups and the resident's sex, age, education, economic status, memberships in formal organizations, length of residence in the home, and section of the home in which he lived. There was little

difference in number of memberships when residents were grouped on the basis of marital status, religious affiliation, place of birth, former residence, nationality background, number of close friends and relatives in the area, or former occupation.

In the majority of cases where the resident belonged to a formal organized group, he was a nominal member only. Over half the memberships in voluntary formal organizations were in organizations affiliated with religious groups. These findings are similar to those of Webber (5), who found that the retired persons he studied belonged most frequently to church-connected associations. Women belonged to proportionately more religious groups than did men.

TABLE 2. MEMBERSHIPS IN INFORMAL GROUPS.

Selected Factors	Number of Residents (N = 105)[a]	Average Number of Memberships in Informal Groups
Sex		
Male	27	5.7
Female	78	7.1
Age		
65-69 years	9	6.2
70-75 years	30	6.2
76-79 years	21	7.9
80-85 years	31	6.9
86-89 years	12	6.3
90-94 years	2	3.5
Education		
Under 7 years	29	6.9
7-9 years	39	6.7
10-12 years	29	6.4
Over 12 years	8	7.4
Economic status		
High	36	7.8
Medium	31	7.5
Low	38	5.1
Memberships in formal organizations		
None	65	5.9
One	22	7.3
Two	8	8.8
Three	7	7.6
Five	3	13.0
Length of residence		
1-12 months	23	6.8
13-36 months	30	7.7
37-72 months	20	8.1
73-108 months	14	5.3
109 months and over	18	4.4
Sections of the home		
M 1-E	20	6.2
M 2-W	8	4.6
F 1-E	14	7.0
F 1-W	3	4.7
F 2-E	40	7.7
F 3-E	9	8.7
F 3-C	3	7.7
F 3-W	8	3.3

[a] This analysis was made for 105 residents since the other 15 entered the home after the study had begun.

3. Approximately two-thirds of all the informal groups were intrasectional in membership (that is, they were composed of members who lived in the same section of the home), and approximately one-third were intersectional. Although the original hypothesis is not completely confirmed, it appears that propinquity is an important factor in informal group membership.

4. The bonds of friendship transcended possible barriers of both economic status and physical distance, and appeared to play an important part in the structure of informal groups within the home. Forty-three residents stated they had been friends of other residents prior to coming to the home, and in all but two cases these old friends were members of some of the same informal groups. The majority of old friendship pairs involved residents from different economic status categories, and it was found that former friends became members of the same informal groups irrespective of where they lived in the home. Former acquaintances did not tend to become members of the same informal groups. Except for old friends, residents of high economic status tended to limit their memberships to groups whose other members were of their own economic status. (This was less frequently the case for residents in the other two economic groups.)

5. Of the four residents who came to the home involuntarily, two were classed as social isolates, neither of whom belonged to an informal group, one belonged to one group and the fourth belonged to two. In contrast to this, the residents who came to the home voluntarily averaged 6.7 memberships in informal groups. (None of the four involuntary residents were able to adjust satisfactorily to the home.)

6. Eighty-four residents indicated that they spent more time since coming to the home in religious activities, 10 residents stated they spent about the same amount of time, and 11 residents admitted that they spent less time than before. The two reasons given most frequently for increased religious activities were the proximity of the chapel and the fact that residents had more time to devote to religious practices. A higher percentage of the non-Catholics than of the Catholics stated that they

spent less time in religious activities. This is understandable, since for several residents the home is situated a considerable distance from their churches. Although non-Catholics were free to attend religious services in the chapel, none of them were observed doing so.

7. The 12 leaders (as determined from sociometric data) were considered by the raters to be either well adjusted or very well adjusted. Only 4 leaders, however, were among the 11 residents who were unanimously rated as very well adjusted.

REFERENCES

1. Burgess, E. W. Social relations, activities, and personal adjustment. *Amer. J. Sociol.*, 1954, **59,** 352-360.
2. Cavan, Ruth. Family life and family substitutes in old age. *Amer. Sociol. Rev.*, 1949, **14,** 71-83
3. Chen, A. S. Social significance of old age. *Sociol. & soc. Res.*, 1939, **23,** 519-527.
4. Orbach, H. L., & Shaw, D. M. Social participation and the role of the aging. *Geriatrics*, 1957, **12,** 241-246.
5. Webber, I. L. The organized social life of the retired: two Florida communities. *Amer. J. Sociol.*, 1954, **59,** 340-346.

AIR IONIZATION, AGE, AND MAZE LEARNING OF RATS*

JULIANA JORDAN, Ph.D., AND BORIS SOKOLOFF, M.D., Ph.D.
(Southern Bio-Research Institute, Florida Southern College, Lakeland, Florida)

In a recent paper, Birren and Kay (3) demonstrated that the swimming speed of young rats was greater than that of old rats. According to Birren (2), slowing in speed response appears to be the key change in aging, and the reaction time of the rat to a random stimulus slows with age (1). Singleton (16), in turn, pointed out that a sequence of movements show greater change in speed with age than does speed itself. Furthermore, Kay and Birren (9) described the effect of benzedrine on the swimming of rats, an effect which was mostly negative as far as swimming speed was concerned.

The earlier work of Dessauer (5), Okada (15), Kimura, Ashiba, and Matsushima (10), Chizhevskii (4), and others reported that an excess of positive ions in the atmosphere causes fatigue and malaise, and might be responsible for a slight elevation in blood pressure. On the other hand, air rich in negative ions brings about a feeling of exhilaration and well-being. More recent investigations, using standardized techniques for increasing air negative or positive ions and for measuring their density, have resulted in a number of publications interpreting the nature of biological activity when influenced by air negative ions. Winsor, Travis, and Beckett (17) established that the bodies of men and animals alike were collectors of atmospheric ions. Holloway (8, pp. 37-135) postulated, on the basis of his experiments, that air negative ions had a stimulating effect on the endocrine system of rats. Eddy, Streltzoff, Williams, and Sciortino (6) found that air negative ions increased the activity of the reticuloendothelial system in rats. Nielsen and Harper (14) found that the inhalation of positive ions by rats reduced the succinoxidase content of the adrenal gland, while air negative ions increased it. Eddy and Sokoloff (7) reported that the retention of calcium in rat tissue was increased when the animals were submitted to air negative ions. Worden and Thompson (18) reported that air negative ionization accelerated the multiplication of cells *in vitro*, and that positive ionization decelerated it.

Krueger and Smith (12, 13), investigating the effect of air ions on living trachea, showed that air negative ions produced a relaxing influence on tracheal muscle, while air positive ions caused contraction. Kornblueh and Griffin (11) and others have reported the results of their clinical studies on the therapeutic value of air negative ionization under certain conditions.

The exact nature of biological activity when the organism is influenced by air negative and positive ions has not been clearly defined. Yet, there is sufficient experimental data to indicate that it has a stimulating effect upon the animal organism. For this reason, the possible effect of air negative ions on the same learning ability of young and old rats was investigated.

MATERIALS AND PROCEDURE

The rats. A British breed of white and brown rats, originally obtained from the Crocker Laboratory, Columbia University, was used for the maze training tests. A total of 300 rats, all males, were tested during the two years of this study. (Eleven more were originally tested, but eliminated from the study because of sickness, death, or the absence of any response during the first or second runs.) The young rats were about 90 days of age and weighed between 140 and 155 grams. The older rats were from 20 to 27 months of age and weighed from 295 to 352 grams. All rats were kept on Purina Laboratory Chow *ad libitum*. For about 10 days before the maze trials, each rat was held in the hands for several minutes daily and put in a water tank for swimming exercises.

The Water Maze. A modified Stone multiple-T-pattern maze was built for these trials. It had fourteen choice points. The motive was escape-from-water. The maze was constructed from galvanized metal, painted black, and placed in a large galvanized tank about 80 inches square. Runways were 4 inches wide and 15 inches deep. Metal non-retrace drop doors were located at five choice points. Dummy doors and cords were located at corresponding points in the blind alleys. The water was eight

* Aided by a grant from The Marcia Tucker Foundation, New York, New York.

inches deep and room temperature, 75-78° F. At the end of each run, the animal went into a wooden turn-table goal box at the front of the maze.

Negative Air Ionization. The negative air ionization was produced by generators emanating negative ions.[1] The source of alpha particles was a polonium foil of about 6.45 sq. cm., developing initially a radioactivity of 0.5 millicurie. The electric field was established to separate positive and negative ions. The field was derived from 110-120 VAC. The negative terminal of a selenium rectifier was connected with a sleeve electrode, making it negative to surrounding objects. The negative ions were repelled into the air, and a small fan built into each generator further aided their spread. The rats' cages were placed in two plywood cubicles in which the density of air negative ions was maintained at 8000-9000 per cc. of air. The density of negative ions was checked twice a day with an Ion Collector and a Beckman Ultrohmeter. Since the humidity of the atmosphere affects negative ion density, there was some fluctuation of about ± 500 negative ions per cc. in the cubicles.

Procedure. Each rat had one run per day for 15 consecutive days, except Sundays. Each day 25 rats were tried. The group of rats selected for the current experiments were about the same age and weight and were kept, five animals to a cage, at room temperature. Before the runs started the rats were put in the water tank for two or three minutes for preliminary exercise. Before the negative ionization trials, the cages with the rats were placed for three hours in the cubicles with the air negative ion density averaging about 8500 per cc. The cages were removed from the ionized cubicles to the maze room about 20 minutes before the runs started.

RESULTS

One hundred fifty young rats about 3 months of age, and 150 old rats, 18 to 22 months of age, were tested for their maze-learning ability. Seventy-five rats of each group were submitted to negative ionization of air. From the analysis of the results summarized in Tables 1 and 2, two facts emerge. Under normal atmospheric conditions the young rats showed a much higher learning ability than the old rats. (The average number of errors was 26.5, and the average total time score, 23 minutes 14 seconds for the young rats. The old rats made almost three times more errors than the young rats, an average of 78.9, and the time score averaged 48 minutes 55 seconds.) While young rats showed much "initiation" in finding the right way for escape, the old rats manifested very little. Many old rats after one or two errors would remain in blind alleys without moving for three or more minutes. Some would return to the entry place as if giving up any hope of reaching their destination. Only after many runs and having learned the proper route for escape, would the old rats swim fast and without interruption or rest.

Quite a different picture was observed when both young and old rats were submitted to negative air ionization. The young rats seemed to be slightly excited and possibly less coordinated; however, neither the number of errors nor the time scores were altered significantly. An average of 27.5 errors in 15 runs, and an average time score of 22 minutes 50 seconds are almost the same figures as obtained in the condition of normal atmosphere. On the other hand, the old rats responded promptly. Their "initiation" period was sharply shortened, they were much more alert, and they did not linger in blind alleys. Their behavior was particularly altered during the first two or three runs. The moment the old rats were put into the maze, they actively looked for the exit, trying again and again to find the proper way. Under the influence of negative air ionization, they reduced the average number of errors from 78.9 (in normal atmosphere) to 38.6; and the average time scores from 48 minutes, 56 seconds (normal atmosphere) to 22 minutes 46 seconds. In other words, their time scores approximated those of the young rats. Some old rats were able, after 15 runs, to make the score in 40 to 45 seconds, swimming as fast if not faster than the young rats. The average time scores for the first run for ionized old rats were reduced from 7 minutes 25 seconds (in normal atmosphere) to 3 minutes 22 seconds.

The standard deviation figures for young and old rats, both for the number of errors and time scores, under normal atmospheric and ionized air conditions of experimentation, offer some interesting facts. The average total number of errors for young rats is 26.5, ± 0.83 (normal atmosphere), and 27.5, ± 0.93 for ionized air, with the average total time score, 23 minutes 14

[1] Supplied by the Wesix Electric Company, San Francisco, Calif.

seconds, ± 47 seconds (normal atmosphere), and 22 minutes 50 seconds, ± 50 seconds (ionized air). Thus there is a slight increase in standard deviation in the ionized young rats group, both for the number of errors and time scores. As mentioned above, some young rats seemed to be excited by negative ionization and were less attentive to their maze learning. With the old rats there seemed to be a reverse situation; under the influence of negative air ionization the average total standard deviation went down both for the number of errors and time scores. Thus for the old rats in normal atmosphere, the average total error number was 78.9, ± 1.56, and the average time score was 48 minutes 56 seconds, ± 1 minute 27 seconds. For the ionized rats, the average total number of errors was 38.6 ± 0.63, and the average time score was 22 minutes 46 seconds ± 33 seconds. Thus the ionized old rats showed much greater

TABLE 1. AGE INFLUENCE ON MAZE LEARNING OF RATS: NORMAL ATMOSPHERE (AVERAGE FIGURES FOR 75 RATS IN EACH GROUP, EACH RAT 15 RUNS).

Run No.	Average No. of errors per rat	S. D.	Average time score per rat in minutes and seconds	S. D.
		Young rats (average age: 3 months)		
1	5.4	2.8	3^m 20^s	1^m 45^s
2	4.2	2.4	3 10	1 46
3	3.8	2.0	2 01	0 56
4	3.5	1.3	1 48	0 42
5	2.2	0.8	1 32	0 45
6	1.5	0.6	1 20	0 40
7	1.1	0.4	1 10	0 38
8	0.9	0.5	1 15	0 40
9	0.6	0.3	1 25	0 41
10	0.7	0.3	1 05	0 39
11	0.6	0.2	0 55	0 31
12	0.5	0.2	1 10	0 40
13	0.6	0.2	0 50	0 29
14	0.5	0.1	0 58	0 23
15	0.4	0.1	1 15	0 24
Av. tot. No. errors per rat for 15 runs: 26.5				
Av. tot. time scores per rat for 15 runs: 23^m 14^s				
		Old rats (average age: 22 months)		
1	10.2	4.2	7^m 25^s	2^m 23^s
2	9.8	4.0	5 45	2 02
3	9.2	3.5	4 55	1 22
4	8.3	4.0	4 43	1 26
5	6.2	2.2	3 10	1 02
6	4.2	1.2	2 50	0 54
7	3.4	1.0	2 22	0 25
8	3.2	0.5	2 28	0 40
9	3.8	0.4	2 55	0 28
10	4.2	0.3	2 10	0 33
11	2.5	0.3	2 45	0 18
12	3.5	0.4	2 12	0 21
13	3.0	0.2	1 50	0 22
14	3 8	0.4	1 40	0 12
15	3 6	0.3	1 46	0 15
Av. tot. No. errors per rat for 15 runs: 78.9				
Av. tot. time scores per rat for 15 runs: 48^m 55^s				

uniformity in their response to maze learning than did the old rats under normal atmospheric conditions.

DISCUSSION

The observations of Birren and Kay (1, 2, 3) showed less of an age change in a continuous swimming task than in a startle reaction time. These investigators found age differences in male rats of 14 per cent for fastest swimming times and age differences of approximately 100 per cent for auditory startle reaction time. The results obtained in the present study with maze learning of young and old rats substantiate Birren and Kay's findings. The figures of the first two runs for young and old rats show considerable difference in the average number of errors and time score; the old rats made two times more errors and their average time scores were two times greater than those of the young rats. If, however, one compares the figures of the fifteenth run, the differences between young and old rats in average time scores is insig-

TABLE 2. AGE INFLUENCE ON MAZE LEARNING OF RATS: AIR NEGATIVE IONIZATION (AVERAGE FIGURES FOR 75 RATS IN EACH GROUP, EACH RAT, 15 RUNS).

Run No.	Average No. of errors per rat	S. D.	Average time score per rat in minutes and seconds	S. D.
		Young rats (average age: 3 months)		
1	5.0	2.9	3^m 02^s	1^m 52^s
2	4.1	2.7	2 32	1 51
3	4.2	2.2	2 02	1 04
4	3.8	1.5	2 03	0 57
5	3.0	1.0	1 22	0 51
6	1.3	0.9	2 30	0 40
7	1.2	0.5	1 08	0 37
8	1.1	0.5	1 28	0 39
9	0.6	0.3	1 33	0 42
10	0.8	0.4	1 03	0 38
11	0.5	0.3	0 58	0 42
12	0.6	0.2	1 12	0 37
13	0 4	0.3	0 55	0 40
14	0.6	0.2	0 58	0 26
15	0.3	0.1	1 04	0 24
Av. tot. No. errors per rat for 15 runs: 27 5				
Av. tot. time scores p r rat for 15 runs: 22^m 50^s				
		Old rats (average age: 21 months)		
1	6.6	2.4	3^m 22^s	1^m 35^s
2	5.5	1.7	2 10	1 01
3	5.8	1.8	2 50	0 55
4	4.0	1.1	1 45	0 45
5	3.2	0.7	2 10	0 42
6	2.5	0.6	1 35	0 28
7	3.8	0.5	1 35	0 22
8	2.4	0.4	1 58	0 30
9	1.8	0.3	1 15	0 18
10	1.0	0.2	0 48	0 21
11	0.5	0.3	0 42	0 19
12	1.1	0 1	0 51	0 17
13	1.0	0.2	0 55	0 18
14	0.5	0.2	0 43	0 21
15	1.0	0.1	0 48	0 11
Av. tot. No. errors per rat for 15 runs: 38.6				
Av. tot. time scores per rat for 15 runs: 22^m 46^s				

nificant. Yet, during the fourteen runs, the old rats, under normal atmospheric conditions of experimentation, made more errors and took more time than the young rats. The explanation of this difference in maze learning between young and old rats can be found in their behavior. The old rats had been losing much time and making many errors at the beginning of each run, excepting the fifteenth. Their startle reaction was always delayed. They hesitated to swim, but once they started, they swam as fast as the young rats. This delay in the startle reaction was considerably reduced by negative ionization, under which they behaved in a manner almost similar to that of young rats. The available experimental evidence indicates a stimulating influence of negative air ionization upon the reticulo-endothelial elements of the endocrine system. The negative results obtained by Birren and Kay (3) in their attempts to reduce the startle reaction period in old rats' swimming trials by the use of benzedrine can be explained by the temporary effect of this drug. It would be worthwhile to study the effects of such hormones as cortisone, or estrogenic or adrenotrophic substances, on the age differences in startle reaction periods of rats.

SUMMARY

A multiple-T-pattern maze with escape-from-water motive was used on 150 rats of an average of 3 months of age and 150 rats of an average of 22 months of age in a study of age differences in maze learning.

The number of errors and the time scores of the group of old rats were about three times and two times greater respectively than those of the young rat group under normal atmospheric conditions; negative air ionization reduced considerably the number of errors and the time scores of the runs of the old rats.

REFERENCES

1. Birren, J. E. Age differences in startle reaction time of the rat to noise and electric shock. *J. Geront.*, 1955, **10,** 437-440.
2. Birren, J. E. Age changes in speed of simple response and perception and their significance for complex behavior. In International Association of Gerontology, Third Congress. *Old age in the modern world.* London: E. & S. Livingstone, 1955. Pp. 235-247.
3. Birren, J. E., & Kay, H. Swimming speed of the albino rat. I. Age and sex differences. *J. Geront.*, 1958, **13,** 374-377.
4. Chizhevskiĭ, A. L. The possibility of regulating certain electric functions of the blood. *Rev. Acad. Columbiana Cienc., Exactas, fis. nat.*, 1940, **13,** 47-49.
5. Dessauer, F. *Zehn Jahre Forschung auf dem physikalisch medizinischen Grenzgebiet.* Leipzig: Georg Tieme, 1931.
6. Eddy, W. H., Streltzov, L., Williams, J., & Sciortino, L. The effect of negative ionization on transplanted tumors. *Cancer Res.*, 1951, **11,** 4. (Abstract)
7. Eddy, W. H., & Sokoloff, B. Effect of negative ionization on cellular proliferation in connection with calcium retention. *Fed. Proc.*, 1951, **10,** 1, Part 1.
8. Holloway, R. J. The physiological effects of ionized air upon growth and on the adrenal system of the normal rat. Unpublished doctoral dissertation, Univer. of San Francisco, 1952.
9. Kay, H., & Birren, J. E. Swimming speed of the albino rat. II. Fatigue, practice, and drug effects on age and sex differences. *J. Geront.*, 1958, **13,** 378-385.
10. Kimura, S., Ashiba, M., & Matsushima, I. Influence of air lacking in light ions and the effects of its ionization upon human beings in occupied rooms. *Japanese J. Med. Sc. VII, Soc. Med Hyg.*, 1939, **3,** 1-12.
11. Kornblueh, I., & Griffin, J. Artificial air ionization in physical medicine. *Amer. J. phys. Med.*, 1955, **34,** 618-631.
12. Krueger, A. P., & Smith, R. F. Effects of air ions on isolated rabbit trachea. *Proc. Soc. exp. Biol. & Med.*, 1957, **96,** 807-809.
13. Krueger, A. P., & Smith, R. F. The effects of air ions on the living mammalian trachea. *J. Gen. Phys.*, 1958, **42,** 69-82.
14. Nielson, C. B., & Harper, H. A. Effect of air ions on succinoxidase activity of the rat adrenal gland. *Proc. Soc. exp. Biol. & Med.*, 1954, **86,** 753-756.
15. Okada, Y. Influence of inhalation of ionized air on blood. *J. Nagoya Med. Ass.*, 1939, **47,** 772-830.
16. Singleton, W. T. Age and performance timing on simple skills. In International Association of Gerontology, Third Congress. *Old age in the modern world.* London: E. & S. Livingstone, 1955. Pp. 221-231.
17. Winsor, T., & Beckett, J. C. Biologic effects of ionized air in man. *Amer. J. phys. Med.*, 1958, **37,** 83-89.
18. Worden, J. L., & Tompson, J. R. Air ion concentration and the growth of cells *in vitro*. *Anat. Rec.*, 1956, **124,** 500. (Abstract)

CHANGING COSTS IN THE PUBLIC CARE OF THE AGED

LLOYD SAVILLE, Ph.D.
(Department of Economics and Business Administration, Duke University, Durham, N. C.)

The care of the aged is becoming a problem of increasing economic importance. Demographic projections which take into consideration increased life expectancy indicate that larger numbers of older persons can be expected in the future; and since custom and law favor early retirement, the cost of public support for older persons will probably become greater. A study of earlier public welfare practices in providing for the aged may prove relevant in planning for the future.

During the past century and a half in the United States the problem of the aged was considered part of the general problem of the poor, and met by local governments by such devices as "boarding out," the poor farm, and cash grants-in-aid. Although historical evidence is sketchy, it is clear that practice has differed from region to region. An intensive study of one area is needed in which, by employing a sampling in depth technique, changes over time can be studied.

THE SAMPLE

For this study the investigator chose a single township which embraced Irasburg, Vermont. Irasburg is apparently typical of towns located in northern New England, where general farming has deteriorated. Free of many of the complexities of larger, more progressive urban communities, it provides a chronology of comparatively unambiguous development. Here the local forces have been left to play out their solutions for one hundred and fifty years with a minimum of interference from without. Detailed records of town meetings were available from the date of the founding of the town, 1803, to the present. Since this community had been used in a wider study of the general problems of local finance (8), much collateral information had already been collected concerning the town's economic development.

This community is admittedly not representative of the United States as a whole. The investigator felt that in this exploratory study a polar case would be a better choice than one thought to be more typical since, with so little general knowledge of the subject available, it is difficult to decide upon effective criteria for selecting a sample. Furthermore, an extreme example may be preferred, not only because fewer unwarranted generalizations will be attempted, but also because a limit can be achieved in at least one parameter.

PROPORTION OF THE AGED AMONG THE GENERAL POOR

A problem of primary significance in studying the history of the public support of the aged is the scarcity of specific data. Usually the cost of the support of the aged and of the maintenance of the poor in general have been lumped in single totals. Only recently have the unique problems of older persons been recognized widely enough to result in specific records being kept for this age group (4).

An attempt was made here to separate the expenses attributable to maintaining individuals in older age groups from the general poor. Since town farms, poor farms, poor houses, and almshouses became progressively institutions for the aged, it might be appropriate to consider their total cost an expense chargeable to the aged. However, by use of the proportions of young and old supported in this way, a somewhat more accurate allocation may be achieved.

Special reports of the Bureau of the Census enumerating paupers in the United States are useful in making this apportionment. Summarized in Table 1, they show that in the period 1890 to 1923 somewhat less than one-half of the residents of almshouses were 65 years of age or over. Because of the increase in life expectancy and the provision of other facilities for younger persons, the proportion of old people in almshouses in the United States increased from about one-third in 1880 to more than one-half in 1923. In Vermont the proportion increased from 46 to 53 per cent.

Comparable statistics for earlier or later years are not available. Prior to 1890, decennial census reports did not give the details necessary for the comparison shown in Table 1 (16). Since 1923 the word "pauper" has become in-

creasingly unpopular; for this and other reasons precisely the same series has not been reported. Instead, details of the institutional population have been made available. Here again, however, a change in the basis on which the tabulation was made (exclusion of persons less than 14 years of age from the enumeration) made it impossible to compare the data with the earlier figures (12, pp. 10, 118). In spite of these difficulties, the general values derived for the years before 1890 and after 1923 do not seem inconsistent with those shown in Table 1.

There is yet another problem. Enumerations of the persons living in almshouses do not reveal when the persons entered. Perhaps the residents of these institutions were persons who were never capable of self-support. They may have been admitted at an early age and then lived out their lives in the institution. Information on this point may be obtained from a second set of statistics giving the ages of persons admitted to almshouses during the years in which a special census was taken. Presented in Table 2, these figures reveal that in the years 1904 to 1922, from one-fifth to one-third of the persons admitted were 65 years of age or over. These figures tend to support the statement by the Bureau of the Census: "The age statistics presented show clearly that almshouses are becoming to an increasing extent institutions for the aged" (11, p. 11). Thus when more specific evidence is lacking, the apportionment to the care of the aged of about two-fifths of the cost of maintaining the poor in general appears to be a reasonable if somewhat modest allocation.

TABLE 1. RESIDENTS OF ALMSHOUSES AGED SIXTY-FIVE AND OVER IN VERMONT AND IN THE UNITED STATES FOR SELECTED YEARS.

Year	Percentage of total residents	
	Vermont	United States
1890	46	33
1903	43	41
1910	42	43
1923	53	54
Average	45	43

Note.—Computed from 17, pp. 786–790; 9, pp. 108, 110–111; 10, p. 89; and 11, p. 50.

TABLE 2. PERSONS ADMITTED TO ALMSHOUSES AGED SIXTY-FIVE AND OVER IN VERMONT AND IN THE UNITED STATES.

Year	Percentage of total admissions	
	Vermont	United States
1904	27	25
1910	20	24
1922	30	36
Average	25	28

Note.—Computed from 9, pp. 120, 122–123; 10, p. 90; and 11, p. 51.

THE RELATIVE COST

Figure 1 shows the costs for care of the aged as a percentage of the total local public expenditures in Irasburg from 1810, the first year public aid was voted, until 1950.

Three periods are evident. The first half century is characterized by sharp fluctuations. During the second 50-year period relative uniformity prevailed, approximating 2 per cent of total local spending. In the third 50-year period, except for higher costs during the depression decade of the 1930's, profits from the poor farm tended to offset expenses of other care of the aged to produce a general balancing of income and outgo. For the most part, in the century and a half, expenditures for the public care of the aged ranged from 1 to 2 per cent of total expenditures, and only in occasional years, mainly in the early period, did values exceed 3 per cent.

Large expenditures were evident in 6 of the first 50 years. One major reason for these high values was the practice of delaying the payment of public indebtedness. Thus the cost of doctoring or nursing the poor or aged might be passed over in one or more meetings before the town finally voted to pay the bill. For example, nothing was voted in the March meeting of

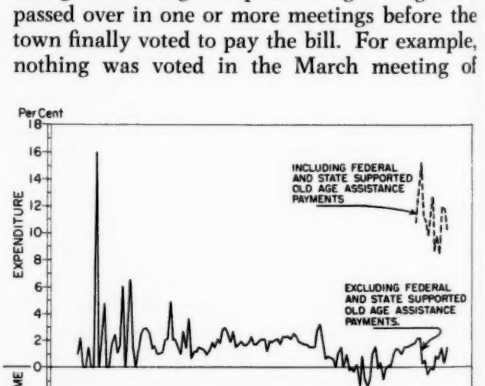


Fig. 1. Income and expenditure associated with the public care of the aged as a percentage of total local public expenditures for all purposes in Irasburg, Vermont, 1810 to 1950, inclusive (derived from 6, Vols. 1-3; 7).

1815 for incidental or poor expense, so an extra amount had to be appropriated in the meeting in 1816. In Figure 1 this appears as an extremely high expenditure for the fiscal year ending in 1817 (6, Vol. 2, pp. 113, 127). Likewise in this early period the local government was inexperienced, and expenditures for schools, for highways, and for the town in general tended to fluctuate widely.

In the second 50-year period fluctuations were modest. Expenditures on the aged tended to hover around 2 per cent of total local spending. Part of this consistency stems from the fact that the poor farm operated throughout this period and some income was usually available to defray not only the expenses incurred by the farm but also the cost of medical and other special care of the aged. Greater uniformity during the period permits the identification of special influences. For example, the higher rates in the later 1860's reflect the extra public dependency produced by the Civil War (6, Vol. 2, p. 301).

During the final period profits from the operation of the poor farm tended to offset other expenses much of the time. Beginning in 1938 a new factor entered the picture: Old Age Assistance payments were made by the state to aged individuals. Financed in small part by a local poll tax but in the main by the state and federal governments, these expenditures were superimposed on the existing local system. Discounting the consistently high payments during the depression decade, these additional funds do not seem to have influenced the relative importance of locally-administered aid.

THE ACTUAL COST

Long-term Fluctuations

A somewhat different perspective of these expenditures may be gained from a review of their dollar amounts. In Table 3 the cost of the public support of the aged is summarized. In current dollars, this care cost each of the inhabitants $.01 per year in 1810 and $1.63 in 1950. This large increase does not take into account the higher payments to the needy aged under the Old Age Assistance program during the final decade of the period. If spending under this latter plan is included, the per capita expenditures by 1950 amount to more than $11.00 per person, or eleven hundred times the rate in 1810.

These figures do not, however, give a true measure of the actual increase, since they make no allowance for changes in the value of the dollar. Accordingly, expenditures are also shown in constant dollars converted to a 1910-1914 base. Even after this adjustment the expansion in the cost of the aged is very large—without Old Age Assistance, some sixty-seven fold; and with OAA, more than four hundred fold.

Even this may not be a true indication of the change. Still another adjustment is feasible. One dollar in 1810 may have been worth much more than a dollar in 1950, not because of the change resulting from inflation, but because of the shift in the availability of money income. This adjustment has severe shortcomings, for it involves not only the value of money units at widely different times, but also the degree to which money was used to settle public obligations.

TABLE 3. APPROXIMATE RECONSTRUCTION OF THE EXPENSES FOR THE PUBLIC CARE OF THE AGED IN IRASBURG, VERMONT, FOR DECENNIAL CENSUS YEARS 1810 TO 1950, ON A PER CAPITA BASIS: IN CURRENT DOLLARS, CONSTANT DOLLARS, AND CONSTANT INCOME DOLLARS.

Year	Current dollars	Constant dollars (1910-1914 = 100)	Constant income dollars (1910-1914 = 100)
1810	$0.01	$0.01	$0.02
1820	0.03	0.04	0.07
1830	0.07	0.12	0.20
1840	0.01	0.01	0.02
1850	0.05	0 09	0.11
1860	0.05	0.07	0.08
1870	0.06	0.06	0.07
1880	0.09	0 11	0.14
1890	0.42	0.18	0.19
1900	0.09	0.11	0.13
1910	0.18	0.20	0.21
1920	(-) 0 31	(-) 0.18	(-) 0.17
1930	0.34	0.19	0 16
1940			
Without OAA[a]	0.73	0.52	0.58
With OAA	5.38	3.79	4.22
1950			
Without OAA	1.63	0.67	n. a.[b]
With OAA	11.84	4.87	n. a.

Note.—Computed from 6, Vols. 1-3, and 7. Per capita adjustments based on decennial population data of the U. S. Bureau of the Census. Constant dollars achieved by use of the Consumers' Price Index of the Bureau of Labor Statistics for the years beginning 1919 (14, p. 68); the Cost of Living Index of the Federal Reserve Bank of New York for the period 1820 to 1918, inclusive (13, p. 235); and, prior to 1820, the Snyder-Tucker General Price Index (13, pp. 232-233). Constant income dollars computed by use of an index of real earnings of farm laborers in Vermont (1, pp. 97-98).

[a] Old Age Assistance payments.

[b] Information for 1950 not available.

An adjustment of the original series to reflect this variable is presented in the last column of Table 3. Based on T. M. Adams' exhaustive study of the real wages of Vermont farmers (1, p. 5), the resulting figures show a much less marked increase. Without allowance for Old Age Assistance they reveal an increase of somewhat more than twenty-five fold; and with OAA, more than two hundred fold.

Yearly Fluctuations

The year-to-year fluctuations are also important. Figure 2 shows on a per capita basis the income and expenditure associated with the public care of the aged. Stated in current dollars, the wide variations depend in part on changes in the value of money, in part on cycles in business activity. Thus high rates of expenditures over a period of several years are associated with prolonged depressions. For example, during the middle of the decade of the 1890's and throughout the 1930's consistently high expenditures were in effect.

Still another and perhaps more important variable underlies these figures; changes in the means of caring for elderly persons account for some of the fluctuations evident in Figure 2. During the early years the general practice of Vermont towns was to board out the needy aged. When the question of care of a particular person was raised at an annual town meeting, bids were made from the floor and the lowest bid accepted. The agreement entailed the care and support of the individual from the time of the meeting in question until the next meeting, or a period of one year. It also involved returning the person to the next meeting with as good clothing as he had had initially. In addition some allowance was often made for the purchase of tobacco; and in at least one instance a sum for the purchase of opium was included (2, p. 16).

Between meetings the boarding of poor and aged individuals was at the discretion of the Selectmen or the Overseer of the Poor. In such cases payments for the cost of "boarding or nursing" were often voted at the March meeting (6, Vol. 2, p. 176). Especially throughout these early years, vigorous action was taken to keep poor and aged persons from becoming a charge on the town. Residence laws were tightened and indigent persons were warned out of town. Between 1843 and 1858, for example, at least 57 families were warned by the Constable to leave (6, Vol. 2, pp. 37-252). That this policy was not successful is evidenced by the recurrence of the same names not only among those warned out of town but also as persons requiring nursing care or aid. Neither was this problem ultimately solved, for as late as 1949 a note in the *Annual Report* reads: "The calls upon this department have been numerous and very much involved, with much conflict as to residence of persons desiring aid. A careful check has been made in all such cases so as to determine the liability of the town" (7, December 31, 1949, p. 19). Aid to residents was deemed a sufficient responsibility; other needy persons simply had to move on.

In an effort to reduce the cost of maintaining the poor and aged, the town purchased a farm in 1861. This move was in keeping with the philosophy of the era that paupers of all ages should be made to support themselves. For example, one boy was formally indentured at age six for the period until his 21st birthday by the Overseer of the Poor so that he might learn the business of farming (6, Vol. 1, p. 44). The old were required to work at the town farm. If persons did not obey the rules of the farm or if they failed to work they might "be confined in some suitable place and fed on short and course (sic) rations until they comply with said rules" (6, Vol. 1, p. 304).

In spite of fond hopes for a reduction in expenses, the poor farm during its early years seems only to have added to the cost of main-

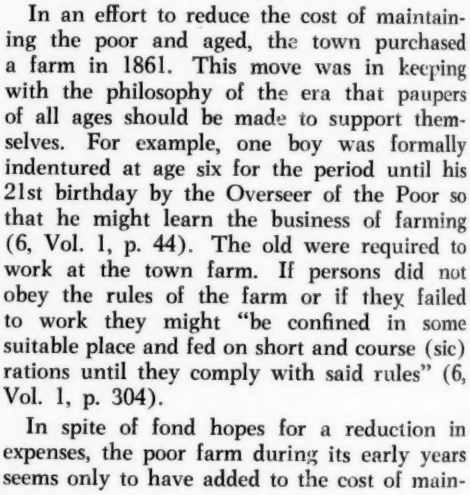


Fig. 2. Per capita income and expenditure associated with the public care of the aged in current dollars for Irasburg, Vermont, 1810 to 1950, inclusive (derived from 6, Vols. 1-3; 7; population adjustment as in Table 3).

taining the poor. Hardly was it well established before the buildings burned in 1863 and replacement costs far exceeded insurance coverage. Also, since each small town instituted its own farm, the numbers of persons cared for on any one farm were seldom large. Thus the economies of scale inherent in the general idea of maintaining the poor and aged as a unit seldom amounted to a great deal (5, pp. 81-82). However, the U. S. Department of the Interior found that "unquestionably the most economical method of treating the pauperism of a community is found in the town farm system" (15, p. 595). With full employment conditions and a booming agricultural market associated with World Wars I and II and briefly in the 1920's, the poor farm showed a sufficient profit to offset completely the other costs of the poor and aged. With the advent of funds from state and federal sources under the Social Security program and a changed philosophy of social responsibility (3, pp. 133-136), the town farm became redundant and was sold in 1944.

In the years since the closing of the farm, expenses have continued to rise. In spite of substantial help from federal and state governments in the form of payments to individuals under the Old Age Assistance program and the increasing availability of retirement and survivorship benefits under the social insurance plan, local costs have increased substantially. Part of this change indicates an attempt to maintain the poor and aged at a higher living standard (3, pp. 182-183), a change which seems to have been associated with and to have grown out of the wider use of relief payments during the 1930's. Part of these higher costs also reflect the strong influence of individual cases in this small community. Thus the Overseer of the Poor reported spending $3,168.28 on the care of one person in the five years prior to that person's death in 1951 at the age of 73 (7, December 31, 1946; December 31, 1947, p. 20; December 31, 1949, p. 19; December 31, 1950; pp. 17-18; December 31, 1951, p. 17.

SUMMARY

A study of the costs of public support for the aged from 1810 to 1950 was made in the small farming community of Irasburg, Vermont —a community which represented an economy resistant to innovations. In spite of the apparent tendency to minimize change in local expenditure for the public care of the aged, over the course of almost a century and a half both relative and actual spending appear to have increased markedly. The method of individual support during the early period shifted to group support at the town poor farm in the middle and later period; now it has shifted back again to individual support by a system of subsistence payments. In spite of the serious shortcomings of the poor farm as an institution for social improvement and its inability to capitalize on the economies of scale when established at the local level, in the simple terms of costs it was clearly the more efficient institution.

REFERENCES

1. Adams, T. M. Prices paid by Vermont farmers for goods and services and received by them for farm products, 1790–1940: wages of Vermont labor. *Vermont Agri. Exp. Station Bull.*, 1944, No. 507.
2. Carter, R. M. The development of financing of local governmental institutions in nine Vermont towns. *Vermont Agri. Exp. Station Bull.*, 1946, No. 529.
3. Corson, J. J., & McConnell, J. W. *Economic needs of older people.* New York: Twentieth Century Fund, 1956.
4. D'Agostino, L. *The history of public welfare in Vermont.* Washington, D. C.: Catholic Univer. of Amer. Press, 1948.
5. Evans, H. C. *The American poorfarm and its inmates.* Mooseheart, Ill.: Loyal Order of Moose, 1926.
6. Irasburg, Vt. Office of the Town Clerk. *Town Records.* Vols. 1-3. Unpublished.
7. Irasburg, Vt. *Annual report of the officers of the Town of Irasburg,* 1900–1950. Published annually.
8. Saville, L. Patterns in local finance: the case of Orleans County, Vermont. *Nat. Tax J.*, in press.
9. U. S. Bureau of the Census. *Paupers in almshouses, 1904.* Washington, D. C.: U. S. Govt. Print. Off., 1906.
10. U. S. Bureau of the Census. *Paupers in almshouses, 1910.* Washington, D. C.: U. S. Govt. Print. Off., 1915.
11. U. S. Bureau of the Census. *Paupers in almshouses, 1923.* Washington, D. C.: U. S. Govt. Print. Off., 1925.
12. U. S. Bureau of the Census. *Sixteenth census of the United States, 1940: special report on the institutional population.* Washington, D. C.: U. S. Govt. Print. Off., 1943.

13. U. S. Bureau of the Census. *Historical statistics of the United States, 1789–1945.* Washington, D. C.: U. S. Govt. Print. Off., 1949.
14. U. S. Bureau of the Census. *Continuation to 1952 of historical statistics of the United States, 1789–1945.* Washington, D. C.: U. S. Govt. Print. Off., 1954.
15. U. S. Department of the Interior. *Population of the United States, ninth census.* Vol. 1. Washington, D. C.: U. S. Govt. Print. Off., 1872.
16. U. S. Department of the Interior. *Report on the defective, dependent, and delinquent classes of the United States, 1880.* Washington, D. C.: U. S. Govt. Print. Off., 1888.
17. U. S. Department of the Interior. *Report on crime, pauperism and benevolence in the United States, 1890.* Part 2. Washington, D. C.: U. S. Govt. Print. Off., 1895.

A SENTENCE COMPLETION PROCEDURE FOR ASSESSING ATTITUDES TOWARD OLD PEOPLE*

PEGGY GOLDE, A.B., AND NATHAN KOGAN, Ph.D.
(The Age Center of New England, Inc., 160 Commonwealth Ave., Boston 16, Mass.)

In recent years there has been an increasing amount of attention devoted to the problem of attitudes toward old people. The subject is discussed at the conceptual level by Barron (3), Linden (5, 6), and Drake (4), all of whom emphasize the negative elements in most people's attitudes toward the aged. Indeed, Barron has taken the extreme position that the evaluation and treatment accorded the aged has much in common with that accorded minority groups in American society.

The bulk of the empirical work in this area has been carried out by Tuckman and Lorge (8), who examined the incidence of "yes" and "no" responses to a set of statements reflecting alleged stereotypes about the aged. (A complete bibliography of this work through 1955 is available in Shock [6]). Unfortunately this work has a number of methodological shortcomings that considerably limit the usefulness of the reported findings. Of particular relevance are: 1) the failure to control for response set effects inherent in items of the yes-no type; 2) the a priori clustering of items in specific content areas (e.g., family, physical, personality traits) that vary widely in the favorability of expressed sentiments toward old people, thereby casting serious doubts on the meaningfulness of means computed for the various clusters; and 3) the absence of any control for the generality of the attitude in the sense that subjects may attribute to "most people" or to "people in general" the very same qualities that were assigned to old people. While Tuckman and Lorge (9) later coped with the response set problem by having Ss estimate the percentages of old people possessing various characteristics, the other methodological difficulties and the failure to present their findings in a theoretical context pointed to the need for a fresh approach to the problem.

For the present research, a sentence completion test was designed to elicit spontaneous expressions of feelings about various aspects of old people's lives. The major purpose of the study was to test the hypothesis that attitudes toward old people are qualitatively different from those concerning the broader class of "people in general." The sentence completion procedure lends itself to a test of this hypothesis, for it is possible, in most cases, to construct matched "experimental" and "control" items. Thus, a typical item in the experimental form reads: "Most old people tend to resent . . ." while the matched item in what we shall call the control form reads: "Most people tend to resent . . ."

Other advantages that accrue to a sentence completion procedure relative to the Tuckman-Lorge technique are the elimination of the response set problem and the possibility, by the judicious construction of sentence stems, of obtaining material that can be interpreted within a psychodynamic context. These advantages must, of course, be weighed against the reliability problems inherent in the coding of sentence completion responses.

METHOD

The Instrument. The 25 matched "experimental-control" sentence stems are presented in the left hand column of Table 1. It will be noted that a wide variety of items are represented. They are intended to reflect, among other factors, the emotions, physical attributes, interpersonal qualities, and values attributed to "old people" and "people in general." In the case of eight of the experimental items (Nos. 7, 10, 12, 14, 16, 20, 23, and 24) it was logically difficult to construct a matched control in the sense in which that term has been applied to the other items in the test. Nevertheless, control items were constructed analogous in some respect to the eight experimental items in question.

* This study was supported by the National Institute of Mental Health, United States Public Health Service, under Research Grant M-1867, and was conducted under the auspices of the Age Center of New England, Inc. We wish to thank Dr. Florence M. Cawthorne for her most helpful participation in the study. For assistance in the collection and analysis of the data we are indebted to Miss Cecily Aronson, Mr. Malcolm Arth, Mrs. Priscilla M. Greenleaf, Miss Jane Livermore, Mrs. Judith W. Stephens, and Mrs. Leonora Zola.

A preliminary version of this paper was presented at the November, 1958, meetings of the Gerontological Society, Inc.

Subjects. One hundred undergraduates (50 men and 50 women) ranging in age from 17 to 23 were selected from two dormitories of Brandeis University. For each sex, forms were alternated so that one half of the *Ss* received the experimental form while the other half received the control form. This design was chosen, rather than one in which *Ss* received both forms, to preclude the possibility that a response to an item in one form might influence the response to that item's matched experimental or control equivalent in the other form.

Coding Procedure. Responses to a given experimental item and its matched control were randomly mixed together, so that the authors could derive a set of scoring categories that would apply to both items without knowledge of the experimental or control identity of the responses.

Once the categories were established, four independent judges coded the data, two judges coding the responses to the experimental form and the other two coding the responses to the control form. By confining each judge to the responses to one form, judges could not unconsciously magnify differences between paired items since they would be unaware of the comparative nature of the study. When a *S*'s response to a particular item contained more than one idea, judges were instructed to code each idea separately, alphabetizing them in the order of their appearance. The judges were informed that "The categories are mutually exclusive: no response idea should be coded under more than one category."

Interjudge agreement for the classification of the responses to the items on the experimental form ranged from 60 per cent to 97 per cent, with an average of 83 per cent. The corresponding values for the control form were 64 per cent to 96 per cent, with an average of 83 per cent. Interjudge disagreements were resolved by presenting all those responses with discrepant categorizations to a fifth judge who decided which of the two categories in question provided the best fit.

Statistical Comparison of Experimental and Control Data. To facilitate statistical analysis, only the first idea contained in a *S*'s response to an item was used. This step does only slight violence to the data, for the large majority of responses contained but a single codable idea. In making statistical comparisons between the experimental and control items, the "Miscellaneous" category was omitted (this accounts for the variations in N's in Table 1), and some reasonably similar categories were combined to increase the frequency in a cell.

Chi-square was used to test the differences between the matched experimental and control items. Where the differences between paired items were statistically significant at the .05 level or better, critical ratios were computed for the various categories within an item pair. This was done to identify those categories yielding substantial experimental-control differences and, hence, contributing most heavily to the chi-square value.

FINDINGS

Table 1 contains the incomplete sentence stems; and, for each experimental-control pair, the scoring categories, the incidence (expressed as a percentage) with which the various categories were assigned to the responses of the experimental and control *Ss*, the critical ratios and their associated probabilities for those categories that achieve or closely approach statistical significance, and the over-all chi-square values.

Of the 17 paired "old people" vs. "people in general" items, 16 yielded chi-squares statistically significant at the .05 level or beyond. Of the eight item pairs for which the "control" was only analogous, seven yielded statistically significant chi-squares. These results clearly confirm the basic hypothesis that beliefs and attitudes toward "old people" differ from those toward "people in general." In testing for the significance of differences between specific categories, two-tail probability values were used, since predictions could not be theoretically justified in many instances. To comment on the results shown in Table 1:

1. *Most (old) people's friendships are . . .* Friendship seems to be an area that evokes less favorable evaluations for "people in general" than for "old people." This may be indicative of an idealized misconception about old people, for lifelong friendships may be perceived as a natural consequence of a long life. Alternatively, enduring friends may be attributed to the aged to lessen *Ss*' guilt feelings arising out of neglect or lack of concern about old people. *Ss* need not feel guilt if they can believe that old people have meaningful friendships of their own. In actuality, other evidence points to a dearth of friendships in the older group as a result of death and the high mobility of American society. Arth (2), reporting the results of intensive interviews with members of an organization for older people sponsored by the public library of an Eastern city, comments on the shallowness of his respondents' friendships and the

extreme difficulty they experience in forming new friendships.

2. *In general, (old) people need . . .* This item pair points up young people's perception that dependent needs are more characteristic of older people than of people in general.

3. *When I am with (an old) (another) person, I . . .* When Ss imagine themselves with an old person, they report that they would respond in a "respectful" subordinate manner. It should be remembered, however, that the subjects of the study are college students whose relationships with older teachers might be colored by respectful attitudes. By contrast, Ss are more likely to picture themselves as initiating a relationship when the other person is not specified as old. The spontaneity that characterizes interpersonal relations with one's peers seems markedly attenuated when the other is perceived to be considerably older than oneself. Significant differences do not emerge with regard to "positive feelings" or "negative feelings," though the direction of the differences is consistent with the trend observed for the other categories, i. e., fewer responses are coded "positive" for the "old people" form.

4. *One of the greatest fears of many (old) people is . . .* The respondents do not consider death a greater fear for old people than for people in general. This result probably reflects what might be called "relative expectations." Younger people might feel that the very fact of the older person's greater proximity to death should lead to a necessary "coming to terms"—to a certain resignation and calmness. For people in general, on the other hand, the idea of death could only be conceived as an unanticipated catastrophe. Empirical support for this interpretation is found in the results for item pair No. 19, where Ss perceive death to be more feared by "most people" than by "old people."

5. *(Old) people's appearance . . .* It is hardly surprising that explicit age related adjectives (e.g. "wrinkled") are invoked more frequently for old people. While positive descriptive adjectives are applied more often to old people, these generally take the form "nice" and "pleasant." Both the "age-related" and "positive" responses may represent a non-committal evasion of a S's genuine feelings in the matter.

6. *(Old) people tend to resent. . . .* Ss cite "younger people" and "condescension" as the major resentments of old people. It is likely that these findings can be traced to the Ss' actual patronizing attitude toward old people. Given these attitudes, young Ss might expect that old people will resent them for it. For the control item, "overconcern, intrusion" and "criticism, authority" are cited as the resentments of "most people." Ss' frustrations and difficulties with parents, teachers, and other authority figures may lead Ss to assume that "most people" have comparable resentments.

7. *In our society (grandparents) (parents) often are . . .* Differences between "grandparents" and "parents" center largely on grandparents being perceived as "undervalued, neglected." Parents, on the other hand, are more likely to be perceived in such negative terms as a "burden," "bothersome," "false," and "hated." The latter finding probably reflects, in part, the adolescent rebellion against parental values and standards. Contrary to expectations, grandparents are not considered more "overindulgent" than parents, nor are parents cited as more "controlling" than grandparents.

8. *Sex for most (old) people . . .* Almost all of the experimental Ss consider sex to be "negligible, unimportant" for old people. In fact, Ss made no mention of the possibility that sex may evoke pleasant reminiscences, though on another item (No. 18), Ss consider reminiscing one of the greatest pleasures of old people.

9. *Most of the (old) people I have known . . .* When Ss respond to these items with descriptive adjectives, old people are described more positively than are people in general. Here again we have further evidence for a generally positive view of old people. As Drake (4) has suggested, however, this may simply reflect that it is socially unacceptable to admit disliking the aged. This observation may be based upon the fact that the large majority of younger people are related to some old person whom they "ought" to love.

10. *At (60) (40), I will be . . .* Not surprisingly, young Ss emphasize basic values of contemporary American society ("marriage and family," "success, contentment, and security") as goals for the middle years of life. For age 60, however, these goals are replaced by the more diffuse ones of an "active, interested" life. Hence, Ss may conceive of activity and interest as the most appropriate defense against the impending onset of old age, since, as it will be recalled item No. 2), old age is often described as a period of dependency.

11. *For a (an old) man, work is often . . .* Work may be conceived as more "difficult" for old people because presumed physical and mental changes with age would make the old person less fit to cope with job demands. In actuality, Welford (10) has shown that, with the exception of work involving time-stress, old people perform adequately in a wide variety of jobs, many involving heavy work. The greater incidence of "tedious" and "economic necessity" for the control item may imply that most men are perceived as performing tedious work out of sheer economic necessity rather than for any reasons intrinsic to the nature of the work performed. Note, finally, that when work is described as "pleasant and psychologically important" no differences are obtained between the "old man" and "man in general" items.

12. *When I think of my relations with my (grandparents) (parents). . . .* While relations with "parents" are reported as more "satisfactory," this can be accounted for, in part, by the substantial number of Ss who gave a non-committal response to the "grandparent" item due to a "failure to remember or other circumstances."

13. *(Old) people, by and large, hope . . .* Achievement, in the eyes of these young Ss, is no longer of any concern to old people. On the other hand, despite the generally negative evaluation of work (cf. No. 11), a substantial number of Ss do stress achievement values for "most people."

14. *When a woman becomes (old) (older) . . .* Ss did not distinguish between women becoming "old" and women becoming "older." If we ignore the difference between the paired items and consider the responses elicited by both items taken together, it is noteworthy that a majority of the respondents stressed loss of attractiveness, or the negative emotional effects attendant on this loss, as a consequence of a woman's aging. Here we have evidence of the ambivalence of younger individuals regarding the aging process. While idealized positive sentiments are often expressed as a response to

the "old people" stem, a stem describing a person passing from a younger to an older age elicits a great deal of negative affect. Perhaps these Ss are responding in terms of a *fait accompli* effect, whereby once people attain old age, they make the best of the inevitable. At the same time, changes brought about by the aging process are to be regretted. Interpretation of the present item pair must also take account of the differential psychological aspect of aging for men and women in American society. Youth and attractiveness are probably considered more important assets for women than for men. Hence, Ss would expect the aging process to diminish those assets, and would perceive, realistically perhaps, the concern aroused by this diminution.

15. *The thing I like best about (old) people* . . . The choice of "serenity" as a best-liked quality of the older person may either be based on Ss' experience with old people or may be viewed as another case of idealization in the sense that "serenity" *ought* to be the ultimate reward for life's tribulations. The Ss may feel that old age should be a period of relaxation and quiet contemplation, or they may have known older people who fit this pattern. The greater incidence of the "interactional qualities" category for the control item is consistent with the responses to other items (Nos. 3 and 9) where we observed that Ss rarely refer to the possibility of close interpersonal relationships with older people.

16. *Many (old) people think the (younger) (older) generation* . . . Clearly, young Ss attribute complementarity to the views the older and younger generations hold of one another. It is not surprising, of course, that Ss should view the older generation with reservations, if they believe that the predominant outlook of old people toward young people is a deprecating one. Whether the older generation does indeed attribute foolish and wild characteristics to the younger generation must remain a moot question for the present.

17. *The thing I like least about (old) people* . . . That irritability should prove to be the least-liked quality differentiating old people from people in general is especially surprising in view of the finding in item pair No. 15, where "serenity" was the best-liked quality more frequently assigned to old people. There seems to be, then, considerable ambiguity in young people's image of the old person. While the present analysis does not tell us whether the same individual assigns mutually contradictory qualities to old people, it is, nevertheless, evident that older people constitute a sufficiently ambiguous class of stimulus persons to permit the attribution of qualities which are polar opposites. The array of qualities attributed to old people does not, however, seem to include such traits as "hypocrisy and selfishness," characteristics that seem more likely to emerge in interpersonal relations among age peers.

18. *One of the greatest pleasures of many (old) people is* . . . The greater attribution of "companionship" as a pleasure of old people rather than of "most people" provides an interesting contrast to those stems (Nos. 3, 9, and 15) in which interpersonal qualities and relationships are cited significantly less often for "old people." This suggests that the meaning of "companionship" in the present item confines old people to relationships with age peers, relatives, or both. Companionship as a "greatest pleasure" for old people is consistent in most respects with the perception of old people's friendships as "enduring, deep" (No. 1). The Ss, in other words, acknowledge that old people as well as people in general require the companionship of others, though such companionship is not felt by the Ss to require their own participation when old people are involved.

19. *For many (old) people, death* . . . Some of the implications of the findings on this item pair have been discussed in connection with item No. 4 above, where no experimental-control difference was found in the frequency of attributing death as "one of the greatest fears." However, where death is referred to explicitly in the sentence stems, as in the present item pair, it is perceived to be more feared by people in general. More than likely, many of the Ss who did not mention death in item No. 4E believe that death has neutral or rewarding aspects for the old person. It is unfortunate that the available data do not permit a further refinement of this problem. We should like to know, of course, whether death is viewed as a coming to terms with the end of life in a philosophic or religious sense or as the ultimate escape from the "burdens of old age."

20. *When I am (old) (older), I would want to be like* . . . Ss are more likely to cite their grandparents or some famous person as a desirable model when the stem refers to "old" as opposed to "older." The tendency to seek identification with a famous person may be an equivalent expression of the wish to be "active and interested" as expressed in item No. 10E. For female Ss, the famous person cited most frequently was Eleanor Roosevelt, a woman noted for her achievements and energy "despite her age." The "older" stem evokes more references to wanting to be like "myself" or an "ideal self." Any interpretation of this item pair must not lose sight of the nature of the sample. For many student Ss, "older" may connote a desired state of emotional and financial independence and other qualifications of adulthood. The term "old," of course, is much less likely to carry this connotation.

21. *When a (an old) person I do not know sits down next to me on a train or bus, I* . . . The findings on this item pair lend further support to the view that Ss find it harder to become interpersonally involved with those considerably older than themselves (No. 3).

22. *To be friends with a (an old) person is* . . . Here again, associations about old people are predominantly positive. The responses to the control item suggest, however, that the positive virtues of friendship with an old person may represent an idealized generalization, rather than the outgrowth of a personal relationship with an older person. Such an interpretation would seem to be consistent with results obtained for other items.

23. *When (an old person) (a young child) is walking very slowly right in front of me, I feel* . . . The present finding further emphasizes the dependent and patronizing elements in Ss' image of old people (Nos. 2, 6). It is not unreasonable to consider the evaluation of others in terms of pity, condescension, and dependency as socially acceptable reflections of unconscious hostility toward the weak. Hence, the finding that Ss are less likely to consciously express aggressive and superiority feelings toward old people than toward children may imply the suppression or repression of such feelings rather than their absence.

24. *When I think of (being old) (growing older), I* . . . This item pair compares the terms "old" and "older" in still another context. Ss distinguish "being

old" by "denying and expressing difficulty in conceiving" of it. In addition, there is a suggestive difference in the "emphasis on future achievement and experience" category. The direction of this difference is consistent with the results obtained in item pair No. 10, where Ss were found to respond in terms of success, contentment and security as the goals of age 40 as opposed to those of age 60. "Growing older," then, seems to connote the years of young and middle-aged adulthood for many of the Ss of the present study. On the other hand, approximately half of the Ss respond to both the "being old" and "growing older" items in a highly negative sense (e.g. fear, depression). This suggests the presence of considerable anxiety in college students regarding aging in general (No. 14).

25. *Most (old) people's lives are. . . .* No significant differences were observed for this item pair. Ss describe "old people's" lives no more positively or negatively than the lives of "most people." Combining the responses to the item pair, we note that a substantial majority of the Ss regard the lives of most people, whatever their age, as lacking in stimulation, meaning, or happiness.

DISCUSSION

The present data clearly demonstrate that the specific terms in which old people are conceived differ substantially from the terms applied to people as a whole. These differences are not always in a direction unfavorable to old people. There are numerous positive elements in the image drawn of the old person. The composition of the present sample—approximately 60 per cent Jewish—may account, in part, for some of the more positive feelings expressed by the Ss. Allport (1) notes that Jews' sympathy with the "underdog" may account for their more positive orientation toward other religious, ethnic, and racial minorities. If old people are conceived of as "underdogs," Jews might be expected to have a more sympathetic attitude toward old people than do members of other religious groups.

We strongly suspect the presence of considerable ambivalence in the attitudes of these younger Ss. For despite the many favorable comments about old people, these Ss view their own aging negatively or "are not able to conceive of it." It is highly probable that the motivational basis of this ambivalence lies in the "present" threat posed by the potential dependency of old people, who may make physical and emotional demands because of increasing infirmity or disease, and by the "future" threat to Ss of seeing themselves in the same dependent role when they are old.

It comes as no surprise, then, that at 60, a substantial number of Ss expect to be active, interested people. Activity seems to represent the best hope of avoiding the feared dependency. Indeed, dependency may well be the Ss' major criterion for the stigma of "old age." An active life would permit one to deny being old.

An achievement-success motif is clearly evident in the data. While Ss devalue work as such, they nevertheless insist that most people hope for success; and, indeed, these Ss picture themselves as attaining this goal at 40. A major difference between the conceptions of "old people" and of "people in general" emerging from our data is that the old are believed to be no longer concerned with achievement or success. Furthermore, their happiness and pleasures are believed to lie not in the future but in their ties with the past, while their concerns are considered to be oriented toward comfort and the companionability of friends and relatives.

Another critical difference between the conceptions of "most people" and "old people" is manifest in the area of interpersonal relations. The Ss of the present study do not wish to become interpersonally involved with old people. Little mention is made of reciprocity, spontaneity, warmth, desire to initiate conversation, or other qualities that comprise the essential ingredients of friendly contacts between peers. Undoubtedly, this is partly a reflection of the fact that our individualistic society does not offer many opportunities for friendly cross-generational contact. This lack of opportunity may influence many of the feelings reported by Ss in the present study. If the younger generation believes the older generation is old-fashioned and narrow-minded and, in turn, thinks the older generation views them as wild and foolish, the interpersonal relationships that do develop will, in part, reflect these views. Furthermore, old people can hardly be expected to be totally unaware of such attitudes and beliefs. Research on an older sample would obviously be required, however, to determine whether old people's feelings about the younger generation and their perceptions of the latter's feelings toward themselves do, in fact, mirror younger people's feelings and perceptions.

Some of the beliefs about old people may well represent a close approximation to "reality." In describing, for example, the major fears of old people as loneliness and dependence, the respondents may be presenting a reasonably accurate picture of the major concerns of older people in our society. Future research efforts

should be directed toward a study of an older sample using measuring instruments comparable to that employed in the present study. We could then examine attitudes and beliefs in terms of their cross-generational match. In addition, we could determine in what respects old people themselves distinguish their age group from "people in general."

SUMMARY

Studies of attitudes toward old people have focused on the aged as a unique group. In the present investigation, an instrument was devised to test the hypothesis that beliefs and attitudes regarding old people are qualitatively different from those concerning the larger class of "people in general."

A sentence completion instrument was chosen in order to elicit *Ss*' spontaneous responses. In the "experimental" form of this instrument, the phrase "most old people" was used in the stem. The sentence stems in the "control" form were virtually identical save for the substitution of the phrase "most people." Twenty-five incomplete sentences were included in each form.

One hundred students, ranging in age from 17 to 23, served as *Ss*. Fifty *Ss* were given the experimental form, while the remaining 50 received the control form. Scoring categories were derived for the responses to each of the 25 stems, and four independent judges coded the material with a high level of agreement.

The results confirmed the hypothesis of differences in beliefs and attitudes toward the two groups. A comparison of the experimental and control forms yielded statistically significant differences for the large majority of items. The implications of the widely discrepant conceptions of "old people" and of "people in general" were discussed in detail.

REFERENCES

1. Allport, G. W. *The nature of prejudice.* Cambridge, Mass.: Addison-Wesley, 1954.
2. Arth, M. J. Friendships and old age, a study of fifteen individuals. Unpublished manuscript. Available from the author, Geriatric Hospitalization Project, 591 Morton Street, Dorchester 24, Mass.
3. Barron, M. L. Minority group characteristics of the aged in American society. *J. Geront.*, 1953, **8,** 477-482.
4. Drake, J. T. *The aged in American society.* New York: Ronald, 1958.
5. Linden, M. E. Effects of social attitudes on the mental health of the aging. *Geriatrics,* 1957, **12,** 109-114.
6. Linden, M. E. Relationship between social attitudes toward aging and the delinquencies of youth. *Amer. J. Psychiat.,* 1957, **114,** 444-48.
7. Shock, N. W. *A classified bibliography of gerontology and geriatrics. Supplement one, 1949-1955.* Stanford, Calif.: Stanford Univer. Press, 1957.
8. Tuckman, J., & Lorge, I. Attitudes toward old people. *J. soc. Psych.,* 1953, **37,** 249-260.
9. Tuckman, J., & Lorge, I. The effect of changed directions on the attitudes about old people and the older worker. *Educ. psychol. Measmt.,* 1953, **13,** 607-613.
10. Welford, A. T. *Ageing and human skill.* London: Oxford Univer. Press, 1958.

TABLE 1. INCOMPLETE SENTENCE STEMS, SCORING CATEGORIES, PER CENTS OF RESPONSES, CRITICAL RATIOS, AND CHI-SQUARE VALUES.

Item No.	Sentence Stems	Scoring Categories	Per Cents of Responses: Experimental Group	Per Cents of Responses: Control Group	CR	P	Chi-Square	P
1E.	Most old people's friendships are . . .	A. Enduring, deep	43.2	14.3	2.95	.01		
		B. Impermanent, shallow	13.6	28.6				
1C.	Most people's friendships are . . .	C. Positive adjectives not included above	27.3	30.9				
		D. Negative adjectives not included above	4.5	21.4	2.02	.05		
		E. S cites reason for friendship	11.4	4.8				
			N = 44	N = 42			14.35	.01
2E.	In general, old people need . . .	A. Assistance (e.g. help, care)	30.2	7.9	2.23	.05		
		B. Security (e.g. personal well-being)	16.3	28.9				
2C.	In general, people need . . .	C. Positive response from others (e.g. love)	53.5	63.2				
			N = 43	N = 38			6.88	.05
3E.	When I am with an old person, I . . .	A. Negative feelings (e.g. discomfort, tension)	27.7	12.5				
3C.	When I am with another person, I . . .	B. Positive feelings (e.g. well-being, ease)	16.7	27.5				
		C. Passive, subordinate response (e. g. respect)	38.9	2.5	3.70	.001		
		D. General outgoing response (e.g. talk)	16.7	57.5	3.65	.001		
			N = 36	N = 40			24.22	.001
4E.	One of the greatest fears of many old people is . . .	A. Death or dying	40.8	35.9				
		B. Loneliness, isolation	30.6	12.8	1.73	.10		
4C.	One of the greatest fears of many people is . . .	C. Rejection, being disliked	6.1	20.5	1.71	.10		
		D. Anxiety response (e.g. insecurity)	4.1	28.2	2.86	.01		
		E. Loss of powers, dependence	18.4	2.6	1.98	.05		
			N = 49	N = 39			19.85	.001
5E.	Old people's appearance . . .	A. Important	7.4	47.6	3.24	.01		
5C.	People's appearance . . .	B. Denial or qualification of importance	7.4	19.0				
		C. Index of kind of person	18.5	28.6				
		D. Positive descriptive adjectives	25.9	4.8	2.17	.05		
		E. Explicit age related adjectives	40.8	0.0	4.17	.001		
			N = 27	N = 42			33.42	.001
6E.	Old people tend to resent . .	A. Younger people	25.0	0.0	2.57	.05		
6C.	People tend to resent . . .	B. Overconcern and intrusion	10.0	34.5	2.19	.05		
		C. Rejection, lack of concern	10.0	24.1				
		D. Criticism, authority	7.5	31.0	2.22	.05		
		E. Condescension, being patronized, helped	32.5	6.9	2.26	.05		
		F. Change or novelty	15.0	3.5				
			N = 40	N = 29			26.99	.001
7E.	In our society, grandparents often are . . .	A. Over-indulgent	20.5	26.3				
		B. Controlling, withholding freedom	17.9	21.1				
7C.	In our society, parents often are . . .	C. Undervalued, neglected	23.1	2.6	2.33	.05		
		D. Positive traits not included above	23.1	15.8				
		E. Negative traits not included above	15.4	34.2	1.65	.10		
			N = 39	N = 38			9.70	.05
8E.	Sex for most old people . . .	A. Negligible or unimportant, past	92.9	4.9	8.02	.001		
8C.	Sex for most people . . .	B. Essential	0.0	29.3	3.47	.001		
		C. Negative, distasteful connotation, taboo	7.1	24.4	1.87	.10		
		D. Positive, pleasurable connotation	0.0	41.4	4.41	.001		
			N = 42	N = 41			66.46	.001

TABLE 1. (Continued).

Item No.	Sentence Stems	Scoring Categories	Per Cents of Responses: Experimental Group	Per Cents of Responses: Control Group	CR	P	Chi-Square	P
9E.	Most of the old people I have known ...	A. Response in terms of S's relation to other	6.3	31.7	2.37	.05		
9C.	Most of the people I have known ...	B. Positive descriptive adjectives	75.0	48.8	2.26	.05		
		C. Negative descriptive adjectives	18.7	19.5				
			N=32	N=41			7.77	.05
10E.	At 60, I will be ...	A. Old age or its approach	21.0	16.2				
10C.	At 40, I will be ...	B. Retirement	15.8	2.7				
		C. Death	15.8	0.0				
		D. Middle age or its approach	0.0	13.5				
		E. Marriage, family	5.3	35.2	2.94	.01		
		F. Active, interested	36.8	10.8	2.36	.05		
		G. Success, contentment, security	5.3	21.6	1.74	.10		
			N=38	N=37			32.36	.001
11E.	For an old man, work is often ...	A. Tedious nature of work	18.2	33.3	1.64	.10		
		B. Difficult nature of work	36.4	6.7	3.15	.01		
11C.	For a man, work is often ...	C. Necessity, economic function of work	13.6	31.1	1.71	.10		
		D. Psychological importance to individual	18.2	11.1				
		E. General pleasantness of work	13.6	17.8				
			N=44	N=45			15.25	.01
12E.	When I think of my relations with my grandparents ...	A. Indication of a satisfactory relation	58.1	81.6	2.46	.05		
12C.	When I think of my relations with my parents ...	B. Indication of unsatisfactory relation	23.3	16.3				
		C. Non-committal (e.g. failure to remember)	18.6	2.1	2.32	.05		
			N=43	N=49			8.82	.05
13E.	Old people, by and large, hope ...	A. Peace, security, comfort	40.0	23.3	1.64	.10		
		B. Happiness and contentment	12.5	27.9				
13C.	People, by and large, hope ...	C. Longevity and health	30.0	11.6	1.80	.10		
		D. Success and money, achievement, fame	2.5	32.6	3.27	.01		
		E. Independence, usefulness	15.0	4.6				
			N=40	N=43			20.18	.001
14E.	When a woman becomes old ...	A. Loses attractiveness	23.1	25.6				
		B. Anxiety over loss of attractiveness	23.1	10.3				
14C.	When a woman becomes older ...	C. S cites negative emotional aspects of age	46.2	41.0				
		D. S cites increased understanding of others	7.6	23.1				
			N=26	N=39			4.00	.30
15E.	The thing I like best about old people ...	A. Sincerity and related adjectives	7.9	21.6				
		B. Kindness and related adjectives	23.7	10.8				
15C.	The thing I like best about people ...	C. Serenity and related adjectives	23.7	0.0	2.80	.01		
		D. Gaiety, humor and related adjectives	10.5	21.6				
		E. Intelligence, wisdom, and related qualities	15.8	8.1				
		F. Interactional qualities (e.g. companionability)	18.4	37.9	1.87	.10		
			N=38	N=37			17.66	.01
16E.	Many old people think the younger generation ...	A. Old-fashioned, narrow-minded qualities	0.0	96.3	7.59	.001		
16C.	Many people think the older generation ...	B. Foolish, frivolous qualities	35.3	0.0	3.12	.01		
		C. Wild. immoral, bad qualities	64.7	3.7	4.61	.001		
			N=34	N=27			57.18	.001

TABLE 1. (Continued).

Item No.	Sentence Stems	Scoring Categories	Per Cents of Responses: Experimental Group	Per Cents of Responses: Control Group	CR	P	Chi-Square	P
17E.	The thing I like least about old people . . .	A. Controlling, interfering qualities	21.9	14.3				
		B. Rigid, prejudiced qualities	28.1	17.1				
17C.	The thing I like least about people . . .	C. Irritability	28.1	0.0	3.06	.01		
		D. Hypocrisy	0.0	34.3	3.33	.001		
		E. Selfishness, miserliness	6.3	31.4	2.31	.05		
		F. Dependency	15.6	2.9				
			N = 32	N = 35			30.52	.001
18E.	One of the greatest pleasures of old people is . . .	A. Love and sex	0.0	41.7	4.28	.001		
		B. Companionship	55.0	25.0	2.66	.01		
18C.	One of the greatest pleasures of many people is . . .	C. Leisure time activities	22.5	33.3				
		D. Reminiscing	22.5	0.0	2.68	.01		
			N = 40	N = 36			29.97	.001
19E.	For many old people, death . . .	A. Feared, frightening	27.3	82.4	4.52	.001		
		B. Positive (e.g. not feared)	39.4	0.0	3.76	.001		
19C.	For many people, death . . .	C. Inevitable	33.3	17.6				
			N = 33	N = 34			24.20	.001
20E.	When I am old, I would want to be like . . .	A. Myself (or ideal self)	7.5	24.4	1.76	.10		
		B. Mother or father	17.5	29.3				
20C.	When I am older, I would want to be like . . .	C. Grandparents	32.5	4.9	2.91	.01		
		D. Other relatives or friends	2.5	14.6				
		E. No one in particular	2.5	9.7				
		F. Some famous person	37.5	17.1	2.07	.05		
			N = 40	N = 41			21.57	.001
21E.	When an old person I do not know sits down next to me on a train or bus, I . . .	A. No special behavior, feelings	53.8	28.9	2.33	.05		
		B. Interest in other (e.g. observe, talk)	28.2	53.3	2.33	.05		
21C.	When a person I do not know sits down next to me on a train or bus, I . . .	C. Feelings of strain or withdrawal	18.0	17.8				
			N = 39	N = 45			6.31	05
22E.	To be friends with an old person is . . .	A. Difficult	18.6	8.3				
		B. Rewarding, other positive qualities	76.7	52.8	2.23	.05		
22C.	To be friends with a person is . . .	C. Emphasis on reciprocity in the relationship	4.7	38.9	3.48	.001		
			N = 43	N = 36			14.49	.001
23E.	When an old person is walking very slowly right in front of me, I feel . . .	A. Pity	22.5	3.3	1.93	.10		
		B. Impatience, annoyance	17.5	13.3				
		C. Aggression, superiority	7.5	33.3	2.44	.05		
23C.	When a young child is walking very slowly right in front of me, I feel . . .	D. Warmth, protectiveness	12.5	26.7				
		E. Feel like passing him	40.0	23.4				
			N = 40	N = 30			14.00	.01
24E.	When I think of being old, I . . .	A. Negative factors (e.g. fear, depression)	53.5	47.4				
		B. Acceptance, lack of concern	11.6	18.4				
24C.	When I think of growing older, I . . .	C. Denial, difficulty in conceiving of it	20.9	2.6	2.15	.05		
		D. Emphasis on future achievement and experience	14.0	31.6	1.64	.10		
			N = 43	N = 38			9.19	.05
25E.	Most old people's lives are . . .	A. Negative (e.g. lack stimulation, happiness)	68.4	77.5				
25C.	Most people's lives are . . .	B. Positive (e.g. happy, fulfilled)	31.6	22.5				
			N = 38	N = 40			.85	.50

JOURNAL OF GERONTOLOGY

VOLUME 14, NUMBER 3
JULY, 1959

Section C

Organization Section
Index to Current Periodical Literature

VOLUME 14, SECTION C JULY, 1959 NUMBER 3

REPORT ON GERONTOLOGY BY SUBCOMMITTEE ON BIOLOGY AND MEDICINE, RESEARCH AND FELLOWSHIPS COMMITTEE OF THE GERONTOLOGICAL SOCIETY, INC.

It is generally recognized that virtually all species grow old and die. Equally apparent is the fact that within a specific environment there is rigid heredity determination of life span. Despite the dramatic consequences of senescence, there is a remarkable lack of conspicuous change in the structure, function, and chemistry of the cells, tissues, and organs that make up the aging individual. Yet the organism loses its ability to survive.

In the wild state aging is no more significant a factor in the life history of the species than is a host of other limiting factors, although it remains a fascinating biological enigma. For the human population aging is both a biological problem and a keenly practical issue. The simple fact is that as the various factors responsible for death at various stages of the life span are brought under control an ever-increasing fraction of the population lives long enough to suffer the handicaps of aging.

Recognizing that problems of aging are assuming ever-increasing importance, the Subcommittee on Biology and Medicine of the Research and Fellowships Committee of the Gerontological Society has addressed itself to a survey of current biological and medical research activities on aging and to an attempt at evaluation of the scope of gerontology as well as itemization of some of the cardinal problems in this field. To implement this plan the Subcommittee has sought the advice and active cooperation of leaders in the field, has effected a survey of research activities in our universities, and has held a series of meetings.

Definition: Gerontology is defined as those branches of knowledge in the life sciences which are concerned with the changes inherent in increments of time with particular reference to post-maturational stages.

Objective: The objective of gerontological research is understanding of the aging process with the ultimate goal of promoting the health and welfare of the population over a maximal number of years. In this sense the Committee endorses fully the W.H.O. definition of health, "Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social conditions."

There are some diseases and conditions which occur more frequently in older individuals and are the cause of much disability and of death. Some believe that the changes resultant to age play a role in the causation, or influence the cause of disease. Some investigators prefer, and rightly so, to study primarily disease conditions; however, if we are to understand the role of the varied factors including age, there must be research on the biology of aging distinct from the studies of disease entities. Comparable situations in other areas of knowledge support this approach; for example, the applied nuclear energy phenomena evolved from basic studies of the atom, much of which was done with no thought of application.

Some Cardinal Problems: The basic biological issues in aging being listed and illustrated with specific research questions are included only to emphasize the paucity of existing data and to outline those problems which have impressed the Subcommittee.

a) Characterization of structural changes. What are age pigments? Why do age pigments appear at very different but characteristic portions of the life span?

b) Characterization of functional changes. What are the age changes in speed of neurally integrated activities?

This study was made possible by a grant (H-3157) from the N.I.H., U.S.P.H.S.

c) Interrelations of structural and functional changes. What are the changes in structure and chemistry of elastic tissue that can be correlated with changes in elasticity?

d) Relation of age changes to the nature and incidence of disease. Why does cancer of the prostate occur only after 40 while sarcoma of the prostate usually occurs in children?

e) Capacity of cells and tissues and the entire organism to offset changes in their environment. What is the basis for the known decrease in ability of older organism to adapt to environmental changes?

f) Genetic influences on age changes. Are there environmental factors which modify the influence of genetic constitution? Are there genetic rate factors in aging? Are there specifically lethal factors, genetically determined, which express themselves late in life?

g) Factors which modify the nature or velocity of age changes. What is the mechanism of the "Lansing effect"? Does the life span of descendants vary with age of the maternal gamete?

h) Characterization of the capacity for replacement of tissues, cells, and biochemical components of cells. How do self-synthetic processes change in aging? Why does liver parenchyma regenerate, heart muscle not?

Research and Training

a) Basic Research: The objective of gerontology has been set forth as search for an understanding of the aging process with the ultimate goal of promoting individual and social health of the population over a maximal number of years.

Bearing in mind that there is an impressive lack of fundamental data upon which one can build to further the applied areas, there is a sense of urgency in the recommendation that basic research on aging be stimulated in every possible way. Itemization of the basic problems of aging would essentially repeat the list of cardinal problems outlined at the beginning of this report. Essentially, our task is to characterize the aging process and to attempt to determine whether or not one or more of these changes are a common denominator running through the various species.

b) Longitudinal Studies: Like research on growth and development, research on aging is heavily dependent on longitudinal studies. Although longitudinal studies by their very nature are slow, expensive, and demanding of space and facilities, universities and donors to universities should facilitate the initiation of such research programs.

c) Graduate Training: An obvious requisite for perpetuation of a species is reproduction in kind. The young field of gerontology has not yet had the opportunity to develop active graduate training programs leading to higher degrees. Any administrative and fiscal device that will enhance creation of such graduate training programs will have a salutary effect on the manpower shortage where research on aging is concerned.

d) Organization:

1) Departments of Gerontology: The Committee does not believe the time is ripe for the establishment of separate departments of gerontology in all medical schools, but does believe all schools should be encouraged to have on the faculty one or more senior individuals interested in gerontology. In order to accomplish this a new source of support must be secured. It is suggested the U.S.P.H.S. give consideration to awarding teaching and training grants in this field.

2) Strategic Placement of Personnel: In amplification of (1), it seems that an effective device for encouraging growth of a field is to place an individual representing that field in a key post. Medical schools, by appointing one or two gerontologists to appropriate preclinical or clinical chairs, can directly foster the training of new gerontologists as well as expanded research interests in problems of aging.

3) Geriatrics: The Committee considered at length the controversial and complex issue of the status of geriatrics as a clinical specialty. Bearing in mind that there are a very few diseases that are distinctive of elderly persons and that the clinical management of elderly patients is not different in principle from the management of young adults, it is believed that geriatrics has no effective place as a clinical specialty. Existence of geriatrics as a subspecialty of internal medicine, however, may encourage more intensive concern with the ever-increasing elderly population.

4) Research Facilities: That creation of the several categorical Institutes within the National Institutes of Health has constituted a major impetus to research in each of the problem areas concerned is now established fact. It can be assumed that comparable stimulus to

research on aging will derive from establishment of an Institute on Gerontology or comparable definitive organization within the National Institutes of Health.*

e) Programs Requiring Special Emphasis:

1) Experimental Animals: A serious limitation to experiments on aging is the short supply of old animals. In the maintenance of breeding colonies it is common practice, for practical reasons, to clear the colonies of those animals not suitable for reproduction. The individual worker can ill afford to spend the years involved in accumulating old animals for his research. A suitable stimulus to research on aging will result from the establishment and support of colonies of small mammals and primates of all ages. Maximal productivity and continuity of such colonies may be expected from the association of these colonies with laboratories which themselves will actively use the experimental material.

2) Long-term Programs: Although some granting agencies have already liberalized their policies to make possible grants of as much as 5 years, research on aging by its very nature requires in many instances the assurance of sustained support for even longer periods of time. Longitudinal studies on primates, extension of McCay's nutritional studies on rats, adaptation to small mammals of Lansing's studies of a transmissible aging factor in rotifers, genetic studies of aging, and radiation mimicry of aging are but a few examples of studies which necessitate support over 10-20 years.

3) Research Facilities: It is generally recognized that the research facilities of most of our universities are severely taxed. Where funds for new construction exist, there are inadequate funds for operating the physical plant; more usually there is a severe shortage of space for research. What support the universities can lend to research is generally committed to long-standing problems, such as cancer, cardiovascular diseases, etc. A relative newcomer to the scene, like gerontology, of necessity is hard pressed for "lebensraum." This is particularly serious because gerontological research goes on, or should go on, not only in medical schools where research facilities, although limited, are still relatively available, but also in other branches of the university where research facilities are even more impoverished.

There is no one form of support to research facilities to be recommended. In some instances it may be most appropriate to set up gerontological research institutes. In other instances, support may take the form of expanding the research operations of existing departments by modernization or alteration of the physical plant, by support of staff, or by extension of pre- and postdoctoral training programs.

4) Teaching Programs: Although it does not seem to be material whether gerontology develops within existing departments or in new university departments, in a new clinical specialty, or a sub-specialty of an existing specialty, it does seem clear that there is a genuine need for a source of support to added personnel within existing university departments. Such personnel would have as their function not only the development of the discipline concerned but also the reinforcement of gerontology. University funds are generally too limited to permit addition of staff with specialized interests. To offset this situation long-range teaching grants should be established to make possible the support of added staff with gerontological teaching and research interests.

5) Personnel Communications: Free movement of personnel is particularly valuable in every field in which there is a paucity of active workers as is the case with gerontology. The establishment of lectureships similar to those set up by Sigma Xi would stimulate interest in research on aging where such interest is nonexistent or nascent. Support of travel of workers in gerontology to laboratories active in related fields should encourage cooperative projects. Organization of short-term graduate courses and research opportunities at institutions like the Marine Biological Laboratory may be expected to attract new thinking and new investigators to the field of research on aging.

Summary on Recommendations

a) Basic research on aging should be supported to a maximal extent.

b) Longitudinal studies on aging should be established wherever feasible.

c) Graduate training in Gerontology should be expanded to increase the supply of investigators in this field.

d) The Subcommittee does not recommend the establishment of Departments of Gerontology within medical schools at this time.

* The two Committee Members associated with the National Institutes of Health abstained from voting on this item.

e) In lieu of (d) the strategic placement of a few faculty members in senior posts is recommended to encourage gerontology.

f) The Subcommittee recommends the establishment of Geriatrics as a subspecialty of internal medicine.

g) Animal colonies, small mammal and primates, should be supported to increase the supply of old animals. Such colonies should be established only where existing personnel have direct research interests in the colonies and have a secondary interest in supplying material.

h) The very nature of research on aging necessitates long-range grants. We recommend that granting agencies consider making commitments of as much as 10-20 years for this purpose.

i) Research facilities in universities should be expanded by any locally appropriate device to encourage research on aging.

j) In order to support added teaching staff for gerontology, teaching grants in gerontology are recommended.

k) Free movements of researchers on aging should be encouraged by special lectureships, travel grants, summer courses and research opportunities at institutes like the Marine Biological Laboratory, and related devices.

l) The Subcommittee recommends the establishment of an Institute on Gerontology or comparable definitive organization within the National Institutes of Health.*

COMMITTEE MEMBERS

Dr. Albert I. Lansing, Chairman, University of Pittsburgh

Dr. Warren Andrew, Indiana University Medical Center

Dr. James Birren, National Institute of Mental Health

Dr. Frank Fremont - Smith, ad hoc, Josiah Macy, Jr. Foundation

Dr. Laurance K. Kinsell, ad hoc, Highland Alameda County Hospital

Dr. John E. Kirk, Washington University School of Medicine

Dr. Robert A. Moore, ad hoc, State University of New York

Dr. Nathan Shock, Baltimore City Hospitals

Dr. Eugene A. Stead, ad hoc, Duke University

Dr. J. Murray Steele, ad hoc, Goldwater Memorial Hospital

* The two Committee Members associated with the National Institutes of Health abstained from voting on this item.

THE GROWTH OF GERONTOLOGY IN MEXICO

MANUEL PAYNO, M.D.

The Mexican Geriatrics Society was founded December 22, 1950, and the Mexican Academy of Gerontology in February, 1951.

Because we noted that there was an erroneous concept in Mexico about gerontology, even among the medical profession, we decided in 1951 to institute a seminar of 50 conferences by specialists, limiting them to the problems of people over 60. In the following year we arranged a one-year course of 85 conferences of two hours each, which was a complete success. The attendance at each conference was over 130, including physicians, medical students, and professional people from other fields. We have succeeded in giving the medical profession and the public in general a correct idea of gerontology and its importance, and today the problems of aging are widely discussed. During the years from 1951 to 1957, Castro Villagrana, Rodríguez Rodríguez, Meneses Hoyos, Pino Quintal, and the author published over 180 articles on gerontology in the daily newspapers for the orientation of the public outside the medical profession.

The National Assembly of Surgeons of Mexico asked for the collaboration of the Mexican Geriatrics Society in preparing a division of their 1952 convention dedicated to geriatrics, and since that time all of the medical conventions dedicate part of their time to the problems of aging.

Local societies of geriatrics have been established in different States of Mexico as sections of the Mexican Geriatrics Society, one in Torreón, State of Coahuila, and another under the direction of Eduardo Aguirre in Monterrey, State of Nuevo León. Another organization is the Pastor Institute in Puebla, State of Puebla, recently founded by a private donation. The Centro de Retiro de Torreón is under the direction of a group of physicians.

The First Panamerican Congress of Gerontology was held in Mexico, D.F., in September, 1956, under the sponsorship of the Department of Health of Mexico. Subsequent to the Congress the following developments in the field of social gerontology have taken place:

1) Some labor contracts contain better provisions for retired laborers.

2) The National Railways has set aside $350,000 (Pesos) for an experimental farm for retired workers.

3) In September, 1958, retired railway workers received 50% of the total amount of the raise given to active workers.

4) Retired civil servants and other organizations are working for increased pensions as the costs of living go up.

5) Social Security of Mexico has accepted one of the points of the First Panamerican Congress of Gerontology, that pensions should be movable with the costs of living.

PROJECTS

A two-year course in geriatrics.—In view of the success experienced with the previous courses in geriatrics for physicians and students, it is planned to establish a two-year course in geriatrics. One of the reasons for arranging such a course at a high professional level is the necessity of curtailing the quacks who lately have made false promises of rejuvenating people, even back to the age of 25 years. We have received many requests from officials and physicians in Latin America for participation in such a course, but one of the major problems is the financing of the project.

The course should include studies in the physiology of the aged, pathology, laboratory analysis, cardiopathology, internal medicine, cancerology, radiotherapy, isotherapy, surgical pathology, psychiatry, rehabilitation, hospital practice, and an introduction to social geriatric medicine.

A large amount of clinical material is available for this course in geriatrics. Thus, there is a State Hospital in Tepexpan, State of Mexico, for chronically sick with 400 beds and in addition a number of public and private asylums with about 2000 aged residents. All these patients need medical attention and rehabilitation from a geriatric point of view.

It is believed that the course should cover a minimum of two years, 4 months a year of theoretical work in the form of conferences and laboratory work, and 6 months of clinical investigation with treatment, rehabilitation, and an evaluation of results. It is planned to conduct a round table discussion weekly on cases under treatment. In addition there will be special conferences on the other clinical aspects and on action programs. After the two years' work, 6 months would be allowed for the preparation of the final examination for a Doctor of Medicine degree in Geriatrics.

National Institute of Gerontology.—We have completed a plan for the organization of the National Institute of Gerontology of Mexico, which was approved by the First Panamerican Congress of Gerontology, with the recommendation that every country of our continent should have an institute to coordinate work done on the problems of old age.

The Mexican Academy of Gerontology and the Mexican Society of Geriatrics have a well-founded hope that the new President of Mexico, Mr. Adolfo Lopez Mateos, a person who has studied all of our social problems, will take a decisive resolution in favor of the Institute of Gerontology of Mexico.

Village for Retired Aged.—At the suggestion of different groups, the Mexican Academy of Gerontology made a study for the founding of a village for retired people to be located in Cuernavaca, State of Morelos, about 70 kilometers from Mexico City. The project will accommodate 1,500 aged people, with all the social services necessary for the well-being of an aged person. The plan provides for houses of different prices to meet the economic conditions of each person; it also has individual houses, apartments, a 20-bed infirmary, a commercial zone, a civic center, church, and recreation and sports facilities. Approximate costs for building the village are listed in table 1.

TABLE 1. APPROXIMATE COST ESTIMATED FOR VILLAGE TO ACCOMMODATE 1,500 PERSONS (IN U.S.A. DOLLARS).

Accommodations	Price per Unit	Total Cost
200 homes, type "A" (all located around a garden): Living room, dining room, kitchen, two bedrooms, bathroom, hobby shop, garage, and 2 covered porches (1,600 sq. ft.)	$ 7,000	$1,400,000
100 homes, type "B" (all located around a garden): Living room, dining room, kitchen, 2 bedrooms, bathroom, den or work shop, garage, and large covered porch (1,000 sq. ft.)	4,700	470,000
25 apartment units containing 10 apartments, each with a living room, dining room, kitchen, one bedroom, and bathroom (5,000 sq. ft.)	21,000	525,000
250 community apartments with living room, one bedroom, bathroom, and communal dining room and kitchen (400 sq. ft.)	1,700	425,000
20-bed infirmary		100,000
Church		100,000
Commercial area		100,000
Civic center		100,000
Land and recreational areas		800,000
Various		160,000
Total		$4,180,000

Presented at the Eleventh Annual Meeting of the Gerontological Society, November 6-8, 1958, in Philadelphia. Dr. Payno's participation in this meeting was made possible by a grant (H-3939) from the National Institutes of Health.

INDEX TO CURRENT PERIODICAL LITERATURE

NATHAN W. SHOCK
Gerontology Branch
National Heart Institute
National Institutes of Health

THE SUBJECT categories are those in *A Classified Bibliography of Gerontology and Geriatrics* by Nathan W. Shock published by Stanford University Press, Stanford, California (1951). Only major headings are used and the Roman numerals correspond to those given in the bibliography. In so far as possible, references are classified according to organ systems. Thus, most of the material on Geriatrics will be found under the organ system involved in the disease. Cross references are indicated by number at the end of each section. When available, abstract references are given *(B.A.—Biological Abstracts, P.A.—Psychological Abstracts,* and *P.I.—Population Index). Abbreviations* for journals are those used in *A World List of Scientific Periodicals Published in the years 1900-1933, 2nd Edition.* For journals not listed, abbreviations were devised according to the general rules used in the above source. It is impossible to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or to send reprints to the Gerontology Branch, Baltimore City Hospitals, Baltimore 24, Maryland. The assistance of the Forest Park Foundation, Peoria, Illinois, in the preparation of these materials is gratefully acknowledged.

GERONTOLOGY

26558. American Medical Association. Council on Medical Service. Committee on Aging: *A. M. A. planning conference on medical society action in the field of aging.* (Sept. 13-14, 1958). The Committee, Chicago, 1958, 105 pp.

26559. American Medical Association. Council on Medical Service. Committee on Aging: *Suggested guides for Medical Society committees on aging adopted by the House of Delegates, American Medical Association, June 1958.* The Committee, Chicago, 1958.

26560. Baumgartner, P.-H.: Mouvement gérontologique 1958. *Rev. franç. Géront., 5:* 17-22, Feb. 1959.

26561. Belgium. Commission de Coordination de l'Office d'Identification: *Les problèmes de la vieillesse. Tome premier; en Belgique. Tome second; à l'étranger.* The Office, Brussels, 1955-57, Vol. I, 244 pp.; Vol. II, 156 pp. Abstr.: *P. I., 25:* No. 1073, 1959.

26562. Bowman, K. M., and B. Engle: Some current trends in problems of the aged. *Geriatrics, 14:* 163-174, 1959.

26563. Britton, J. H., and H. L. Orbach: Foundation and government support for social gerontology; a survey report. *Newsletter (Geront. Soc.), 5:* 7-8, Sept. 1958.

26564. Burch, G.: Interesting observations of the aging process. *Arch. intern. Med., 103:* 1-3, 1959.

26565. Chapman, A. L.: Considering the aged. *Publ. Hlth. Rep., Wash., 74:* 333-337, 1959.

26566. Dailey, C. A.: The natural structure of the life history. *Vita Humana, 2:* 11-24, 1959.

26567. Diekmeer, L.: (Death and aging in Hans Baldung's creative work.) *Med. Bild, 1:* 38-42, 1958.

26568. Fabry, C.: L'échange isoionique des phosphates de calcium avec le calcium radioactif. III. La réversibilité de l'échange du phosphate de Ca/P 2. 14, et l'influence du vieillissement du solide. *Bull. Soc. Chim. Biol., Paris, 40:* 1203-1214, 1958.

26569. Friederichs, K.: *Lebensdauer, Altern und Tod in der Natur und im Menschenleben.* Vittorio Klostermann, Frankfort am Maine, 1959, 210 pp.

26570. Geschickter, C. F.: Aging of individuals; some fundamental aspects of the aging process. *In: VA Prospectus; Research in Aging.* U. S. Govt. Print. Office, Washington, 1959, pp. 83-105.

26571. Great Britain. National Corporation for the Care of Old People: *Eleventh annual report for the year ended 30th September, 1958.* The Corporation, London, 1958, 39 pp.

26572. Haxel, O.: Geologische und archäologische Datierungen mit C^{14}. *Naturwissenschaften, —:* 164-169, 1957. Abstr: *Z. Altersforsch., 12:* 382-383, 1959.

26573. Houtermann, F.: Radioaktivität und Alter der Erde. *Naturwissenschaften, 44:* 157, 1957. Abstr: *Z. Altersforsch., 12:* 381, 1959.

26574. Leake, C. D.: The Duke University Council on Gerontology. (Editorial.) *Geriatrics, 14:* 203, 1959.

26575. Lipschütz, A.: *Warum wir sterben.* Franckh'sche Verlagshandlung, Stuttgart, 1923, 77 pp.

26576. Maine. Committee on the Aging: *Progress report; 1958.* The Committee, Augusta, Dec. 1958, 7 pp.

26577. Maryland (State of). Legislative Council. Committee on Problems of Aging: *Report of the legislative council committee on problems of the aging.* The Committee, Baltimore, Nov. 1958, 13 pp.

26578. Morpurgo, M.: V simposio della società svizzera di gerontologia; Ginerva, 29 novembre 1958. *Gior. Geront., 7:* 92-95, 1959.

26579. Ohio. Governor's Conference on Aging: *Report to the citizens of Ohio; 1958.* The Conference, Columbus, Feb. 14, 1958, 11 pp.

26580. Schaie, K. W.: Cross-sectional methods in the study of psychological aspects of aging. *J. Geront., 14:* 208-215, 1959.

26581. Texas Society on Aging: *Conference proceedings of the second annual meeting of the Texas Gerontological Society, November 14-15, 1958, Austin, Texas.* The Society, Dallas, 1958, 37 pp. (Mimeogr.).

26582. U. S. Department of Health, Education and Welfare. Public Health Service. National Institutes of Health: *Aging; a review of research and training grants supported by the National Institutes of Health.* U. S. Govt. Print. Office, Washington, 1958, 50 pp.

26583. U. S. Department of Health, Education and Welfare. Public Health Service. National Institutes of Health. National Heart Institute. Analysis and Reports Section. Grants and Training Branch. (Prepared for the National Advisory Heart Council by May Sherman): *Aging; a review of research and training grants supported by the National Heart Institute; fiscal years 1949-1958.* The Branch, Bethesda, 1958, 47 pp. (Mimeogr.).

26584. U. S. Veterans Administration: *Medical research in the Veterans' Administration. Vol. I.* Prepared by the Department of Medicine and Surgery of the Veterans' Administration. (Refer to Section 5, Problems of Aging, pp. 10-14). U. S. Govt. Print. Office, Washington, Jan. 30, 1959, vii, 55 pp.

26585. U. S. Veterans Administration: *Va prospectus; research in aging.* U. S. Govt. Print. Office, Washington, 1959, v, 125 pp.

26586. Various: Congrès de la Section Clinique Européenne de l'International Association of Gerontology; Nancy, 25 et 26 juin 1959 — Vittel, 27 et 28 juin 1959. *Rev. franç. Géront., 5:* 73-74, Feb. 1959.

26587. Various: Giornata nazionale dell'anziano. *Gior. Geront., 6:* 1037-1039, 1958.

26588. Various: Kongressberichte; Bericht über die 5. Jahresversammlung der Schweizerischen Gesellschaft für Gerontologie im Kantonsspital Genf am 29.11.1958. *Z Altersforsch., 13:* 95-102, 1959.

26589. Various: La gerontologia e geriatria nei congressi; Riunione Toscana. (Livorno, 22 giugno 1958). *Riv. Geront. Geriat., 8:* 9-11, 1959.

26590. Various: Prima riunione della sezione clinica europea della International Association of Gerontology. *Gior. Geront., 6:* 1027-1031, 1958.

26591. Anonymous: Gerontology; discussion group. *Publ. Hlth. Rep., Wash., 73:* 1113-1120, 1958.

26592. Anonymous: VII congresso nazionale della società italiana di gerontologia e geriatria. *Gior. Geront., 7:* 9-12, 1959.

See also Nos. 27061, 27164, 27215, 27236, 27276, 27310.

BIOLOGY OF AGING

I. Cellular Biology and Physiology (includes plants)

26593. Ashley, F. L., R. F. Sloan, A. N. Schwartz, H. Stein, W. P. Longmire, Jr., and Sister Gertrude Joseph: Studies on mammalian homotransplants of skin. I. Tolerance induced with a pooled antigen in rats. *Plastic & Reconstr. Surg., 22:* 462-470, 1958.

26594. Bergersen, F. J.: The bacterial component of soybean root nodules; changes in respiratory activity, cell dry weight and nucleic acid content with increasing nodule age. *J. gen Microbiol., 19:* 312-323, 1958.

26595. Casassa, P. M., G. L. Turco, F. Ghemi, and C. Forneris: Richerche sulla permeabilità capillare nei vecchi con albumina I^{131}. *Acta geront., 8:* 111-122, 1958.

26596. Glass, E.: Aneuploide Chromosomenzahlen in den Mitosen der Leber verschieden Alter Ratten. *Chromosoma, Berlin, 9:* 269-285, 1958.

26597. Kazarian, V. O., and E. C. Avundzhian: (Variations in enzymic activity of leaves of trees of varying ages and during vegetative propagation.) *C. R. Acad. Sci. U.R.S.S. (Dokl.), 108:* 958-951, 1956. Abstr: *Biol. Sci., 11:* No. 5855, 1958.

26598. Kazarian, V. O., and A. I. Melkonian: (On the significance of age variations of the leaves in the ontogenetic development of annual plants.) *Dokl. Akad. Nauk. Armiansk. S.S.S.R., 21:* 231-234, 1955.

26599. Plaisted, P. H.: Biochemical changes during development and ageing of Acer platanoides leaves. *Contr. Boyce Thompson Inst., 19:* 245-254, 1958. Abstr: *Biol. Sci., 11:* No. 3437, 1958.

26600. Shul'skis, —.: (Morphological characteristics of nuclei in various skeletal muscles of horse.) *Trud. Akad. Nauk. Lith. S.S.S.R., 45:* 115-123, 1956. Abstr: *Biol. Sci., 11:* No. 1744, 1958.

26601. Walker, R.: Age changes in the rat's exorbital lacrimal gland. *Anat. Rec., 132:* 49-69, 1958.

26602. Weinstein, L. H., and H. J. Laurencot, Jr.: Senescence of roses. II. Dark fixation of carbon dioxide by cut Better Times roses at different stages of senescence. *Contr. Boyce Thompson Inst., 19:* 327-340, 1958. Abstr: *Chem. Abstr. 52:* No. 20444, 1958.

See also Nos. 26774, 26808, 26869, 26888.

II. Climate

26603. Hartung, M., H. W. Knipping, H. Venrath, M. Adrianza, J. Gomez, E. Hirschhaut, and F. Tamayo: Herz- und Altersprobleme im tropischen südamerikanischen Hochgebirge. (Schluss). *Münch. med. Wschr., 100:* 74-77, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 333, 1959.

IV. Longevity

(case reports, drugs, heredity, marriage, occupation, and sex differences)

26604. Alvarez, W. C.: A centenarian just died. (Editorial). *Geriatrics, 14:* 202, 1959.

26605. Bagozzi, B.: Note pratiche sulla longevità; rilievi nel trentino. *Acta geront., 8:* 202-206, 1958.

26606. Markhanen, T. K., and R. Nordman: (The social structure of the Finnish physicians and its variations during 1900-1952.) *Nord. hyg. Tidskr., 38:* 225-230, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 318, 1959.

26607. Shettles, L. B.: Biological sex differences with special reference to disease, resistance and longevity. *J. Obstet. Gynaec., 65:* 288-295, 1958. Abstr: *P. I., 25:* No. 1143, 1959.

26608. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics. Mortality from each cause by color and sex; United States, 1957. *Vit. Statist., Spec. Rep., Nat. Summaries, 50:* (2), 34-62, 1959.

See also No. 26612.

IV-C. Longevity: *Comparative Physiology*

26609. Cihar, J., and F. Stanislav: (Food and determination of age and rate of growth from scales of rudd.) *Acta Soc. zool. Bohem., 22:* 13-30, 1958. Abstr: *Biol. Sci., 11:* No. 3673, 1958.

26610. Comfort, A.: Mortality and the nature of age processes. *J. Inst. Actu., 84:* (Pt. 3), 263-280, 1958.

26611. Davies, L.: The age of females of *Simulium ornatum* Mg. (Diptera) attracted to cattle. *Bull. ent. Res., 48:* 535-552, 1957. Abstr: *B. A., 9:* No. 4008, 1958.

26612. Fortuyn, A. B. D.: Non-genetic sib resemblance in regard to the life span in mice caused by a gradient. *Genetica. 29:* 205-221, 1958.

26613. Frothingham, T. E.: Effect of aging and rotation on human amnion cell response to polio and sindbis viruses. *Proc. Soc. exp. Biol., N. Y., 100:* 505-510, 1959.

26614. Gillies, M. T.: A modified technique for the age-grading of populations of *Anopheles gambiae. Ann. trop. Med. Parasit., 52:* 261-273, 1958.

26615. Hagen, K. W., Jr.: The effects of age and temperature on the survival of oocysts of *Eimeria stiedae. Amer. J. vet. Res., 19:* 1013-1014, 1958.

26616. Rockstein, M.: Longevity of male and female house flies. *J. Geront., 12:* 253-256, 1957.

26617. Simms, H. S., and B. N. Berg: Longevity and the onset of lesions in male rats. *J. Geront., 12:* 244-252, 1957.

26618. Spirin, A. S., A. G. Skavronskaia, and A. Pretel'-Martines: (Nucleic acid content in *Escherichia coli* during aging of cultures.) *Mikrobiol., Moscow, 27:* 273-275, 1958.

26619. Wood, J. E.: Age structure and productivity of a gray fox population. *J. Mammal., 39:* 74-86, 1958. Abstr: *Biol. Sci., 12:* No. 1500, 1959.

26620. Zaitseva, G. N., and A. N. Belozerskii: (The chemistry of Azotobacter. VI. The carbohydrate composition of Azotobacter agilis 22-D with reference to the age of the culture.) *Mikrobiol., Moscow, 27:* 416-421, 1958.

See also Nos. 26596, 26600, 26695, 26712, 26759, 26760, 26798, 26799, 26806, 26822, 26854, 26860, 26896, 26898, 26905, 26910, 26911, 26912, 26927, 26956, 27005, 27149.

IV-H. Longevity: *Mortality Rates*

26621. Capone-Braga, P.: Considerazioni sulle cause de morte in Italia nel 1952-54 nei confronti del 1938-40. *Rendic. Ist. Super. San., Roma, 20:* 1143-1151, 1957. Abstr: *P. I., 25:* No. 1174, 1959.

26622. Deeny, J.: Cancer mortality in the Republic of Ireland; a changing pattern. *Irish J. med. Sci., —:* (389), 199-215, 1958. Abstr: *P. I. 25: No.* 1175, 1959.

26623. Delaporte, P. J.: Sur les tables de mortalité de générations; effects de la second guerre mondiale et des antibiotiques. *Bull. Inst., int. Statist., Rio de J., 35:* 445-454, 1957. Abstr: *P. I., 25:* No. 1163, 1959.

26624. Gramm, H.: Die Krebssterblichkeit in Japan in internationalem Vergleich. *Z. Altersforsch., 11:* 200-222, 1958. Abstr: *P. I., 25:* No. 1180, 1959.

26625. Gutman, R.: Birth and death registration in Massachusetts. II. The inauguration of a modern system, 1800-1849. *Milbank mem. Fd. quart. Bull., 36:* 373-402, 1958.

26626. Heasman, M. A.: Vital statistics. *Med. Ann., Bristol, 76:* 511-517, 1958.

26627. Italy. Istituto Centrale di Statistica: *Indagine statistica sulle concause di morte 1951-1954.* Suppl. ann. Statist. Sanitarie 1955, Rome, 1958, 232 pp. Abstr: *P. I., 25:* No. 1182, 1959.

26628. Kacprzak, M.: Por qué vivimos el doble de nuestros abuelos. *Med. Rev. mex., 38:* 164-166, 1958. Abstr: *P. I., 25:* No. 1137, 1959.

26629. Kerridge, D.: A new method of standardizing death rates. *Brit. J. prev. soc. Med., 12:* 154-155, 1958. Abstr: *P. I., 25:* No. 1433, 1959.

26630. Klinger, A., and A. Schleiffer: (Figures relating to deaths caused by heart diseases.) *Demográfia, Budapest, 1:* 128-140, 1958. Abstr: *P. I., 25:* No. 1183, 1959.

26631. Lyra Madeira, J.: Some considerations about the estimate of c and its variances in Gompertz, Makeham and Makeham's modified cases. *Bull. Inst. int. Statist., Rio de J., 35:* 154-155, 1958. Abstr: *P. I., 25:* No. 1434, 1959.

26632. Metrop. Life Insur. Co.: Heart disease in middle life. *Statist. Bull. Metrop. Life Insur. Co., 40:* 1-4, Feb. 1959.

26633. Metrop. Life Insur. Co.: Little change in mortality for 1958. *Statist. Bull. Metrop. Life Insur. Co., 40:* 4-8, Jan. 1959.

26634. Murray, M. A.: *A geographic analysis of mortality for selected Ontario and Ohio-Indiana cities.* Univ. Microfilms, Ann Arbor, Publ. No. 15, 051, 1955, ix, 195 pp.

26635. New York. Health Information Foundation: Trends in cancer control. *Progr. Hlth. Serv., 8:* (2), 1-6, 1959.

26636. Puffer, R. R., and L. J. Verhoestraete: Mortality from cardiovascular diseases in various countries, with special reference to atherosclerotic heart disease; a preliminary analysis. *World hlth. Org., 19:* 315-324, 1958. Abstr: *P. I., 25:* No. 1192, 1959.

26637. Resta, G.: Comparabilità delle statistiche della mortalità. *Riv. ital. igiene, 17:* 531-541, 1957. Abstr: *P. I., 25:* No. 1141, 1959.

26638. Saxén, E., and A. Korpela: (Incidence of cancer in Finland according to the cancer register.) *Suom. Lääk. lehti, 13:* 741-769, 1958. Abstr: *P. I., 25:* No. 1194, 1959.

26639. Schinz, H. R., and T. Reich: Zunahme, Konstanz und Abnahme der Krebsgefährdung in Frankreich und in der Schweiz. *Dtsch. med. Wschr., 83:* 487-488, 1958. Abstr: *P. I., 25:* No. 1195, 1959.

26640. Scrocca, P.: Tubercolosi e cancro dell'apparato respiratorio; rilievi sui dati di mortalità di un ventennio. *Lotta c. Tuberc., 27:* 983-990, 1957. Abstr: *P. I.* 25: No. 1197, 1959.

26641. Segi, M., S. Fujisaku, and M. Kurihara: Geographical comparison of deaths from malignant neoplasms; a study of age-adjusted death rates for malignant neoplasms in various countries. *Acta Unio int. contra Canc., 14:* 591-598, 1958.

26642. Stamm, H.: Emboliemortalität und Alter. *Gynaecologia, 146:* 266-270, 1958.

26643. U. S. Department of Health, Education and Welfare. Public Health Service. Health Information Foundation: The changing status of polio. *Prog. hlth. Serv., 8:* (3), 1-6, 1959.

26644. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; tuberculosis of respiratory system. *Vit. Statist., Spec. Rep., 49:* (3), 33-47, 1958.

26645. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; tuberculosis, other forms. *Vit. Statist., Spec. Rep., 49:* (4), 49-63, 1958.

26646. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; syphilis and its sequelae. *Vit. Statist., Spec. Rep., 49:* (5), 65-79, 1958.

26647. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; typhoid fever. *Vit. Statist., Spec. Rep. 49:* (6), 81-87, 1959.

26648. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; dysentery, all forms. *Vit. Statist., Spec. Rep., 49:* (7), 89-103, 1959.

26649. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; scarlet fever and streptococcal sore throat. *Vit. Statist., Spec. Rep., 49:* (8), 105-119, 1959.

26650. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; diphtheria. *Vit. Statist., Spec. Rep., 49:* (9), 121-134, 1959.

26651. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; whooping cough. *Vit. Statist., Spec. Rep., 49:* (10), 135-148, 1959.

26652. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; meningococcal infections. *Vit. Statist., Spec. Rep., 49:* (11), 149-163, 1959.

26653. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; acute poliomyelitis. *Vit. Statist., Spec. Rep., 49:* (12), 165-179, 1959.

26654. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; measles. *Vit. Statist., Spec. Rep., 49:* (13), 181-194, 1959.

26655. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; typhus and other rickettsial diseases. *Vit. Statist., Spec. Rep., 49:* (14), 195-201, 1959.

26656. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malaria. *Vit. Statist., Spec. Rep., 49:* (15), 203-209, 1959.

26657. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasms. *Vit. Statist., Spec. Rep., 49:* (15), 211-225, 1959.

26658. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasm of buccal cavity and pharynx. *Vit. Statist., Spec. Rep., 49:* (17), 227-241, 1959.

26659. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasm of digestive organs and peritoneum. *Vit. Statist., Spec. Rep., 49:* (18), 245-259, 1959.

26660. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasm of respiratory system. *Vit. Statist., Spec. Rep., 49:* (19) 261-275, 1959.

26661. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasm of breast. *Vit. Statist., Spec. Rep., 49:* (20), 277-285, 1959.

26662. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasm of genital organs. *Vit. Statist., Spec. Rep., 49:* (21), 287-301, 1959.

26663. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasm of urinary organs. *Vit. Statist., Spec. Rep., 49:* (22), 303-317, 1959.

26664. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; malignant neoplasm of other and unspecified sites. *Vit. Statist., Spec. Rep., 49:* (23), 319-333, 1959.

26665. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; leukemia and aleukemia. *Vit. Statist., Spec. Rep., 49:* (24), 335-349, 1959.

26666. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death rates for selected causes by age, color, and sex: United States and each state, 1949-51; other neoplasms of lymphatic and hematopoietic tissues. *Vit. Statist., Spec. Rep., 49:* (25), 351-365, 1959.

26667. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality from each cause; United States, 1955-57. *Vit. Statist., Spec. Rep., Nat. Summaries, 50:* (1), 3-31, 1959.

See also Nos. 26610, 26719, 27096.

IV-I. Longevity: *National Groups*

26668. Amsterdam. Royal Tropical Institute: The Indonesian town; studies in urban sociology. *In: Selected Studies in Indonesia.* W. van Hoeve, Ltd., Hague & Bandung, 1958, vol. 4, xxxvi, 382 pp. Abstr: *P. I. 25:* No. 1378, 1959.

26669. de Arruda Gomes, O. L.: Considerações sobre as tábuas de mortalidade italianas. *Rev. brasil. Odont., 18:* 118-128, 1957. Abstr: *P. I., 25:* No. 1162, 1959.

26670. Germany. Federal Republic. Statistisches Bundesamt. (By Henriette Peters): Die Sterblichkeit der alten Leute. *Wirtsch. u. Stat., 10:* 386-388; 374, 1958. Abstr: *P. I. 25:* No. 1160, 1959.

26671. Italy. Istituto Centrale di Statistica: Tavole di mortalità della popolazione italiana 1950-53. *Boll. Mensile Statist., 32:* (11), 5-7, 1957. Abstr: *P. I., 25:* No. 1164, 1959.

26672. Japan. Welfare Ministry. Institute of Population Problems: *The 10th abridged life table (April 1, 1956-March 31, 1957).* The Institute, Tokyo, 1957, 21 pp.

26673. Japan. Welfare Ministry. Institute of Population Problems: *The 11th abridged life table (April 1, 1957-March 31, 1958). The Institute* Tokyo, 1958, 22 pp.

26674. Lichtenberg, F., and L. Galindo: Trends and changes in mortality causes in Puerto Rico based on autopsy material between 1926-1953. *Schweiz. Z. Path. Bakteriol., 21:* 623-628, 1958. Abstr: *P. I., 25:* No. 1185, 1959.

26675. Michalup, E.: Algunos aspectos demográficos de la población de Venezuela. *Bull. Inst. int. Statist., Rio de J., 35:* 325-331, 1957. Abstr: *P. I., 25:* No. 1305, 1959.

26676. Mortara, G.: Le nuove tavole di mortalità e di sopravvivenza per l'Italia. *G. Econ. annal. Econ., 16:* 552-565, 1957. Abstr: *P. I., 25:* No. 1166, 1959.

26677. Naddeo, A.: Tavole di sopravvivenza della popolazione italiana secondo la mortalità dell'anno 1955. *Riv. ital. Econ., 11:* 143-169, 1957. Abstr: *P. I., 25:* No. 1167, 1959.

26678. Poznanski, T.: Quelques remarques au sujet des taux de mortalité dans la province de Québec. *Actualité econ., 34:* 244-256, 1958. Abstr: *P. I., 25:* No. 1140, 1959.

26679. Sarmento, A.: Aspectos da mortalidade em Angola. *J. méd., Pôrto, 36:* 359-360, 1958. Abstr: *P. I., 25:* No. 1142, 1959.

V. Metabolism

26680. Albanese, A. A., R. A. Higgons, E. J. Lorenze, and L. A. Orto: Effect of dietary proteins on blood cholesterol levels of adults. *Geriatrics, 14:* 237-243, 1959.

26681. Binazzi, M.: Richerche sul comportamento dell'attività succinodeidrogenasica della cute. *G. ital. Derm. Sif., 98:* 509-525, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 290, 1959.

26682. Binet, L.: L'oxygène, aliment des vieillards. *Rev. franç. Géront., 4:* 203-204, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 378, 1959.

26683. Castellani, L., and G. Bertola: Influenza di un estratto di mucosa gastrica sul comportamento dei chilomicroni de sangue in condizioni basali e dopo pasto grasso nel soggetto di età senile *Minerva med., Torino, 49:* 3822-3825, 1958.

26684. Furst, S., A. Lajtha, and H. Waelsch: Amino acid and protein metabolism of brain. III. Incorporation of lysine into proteins of various brain areas and their cellular fractions. *J. Neurochem., 2:* 216-225, 1958. Abstr: *Biol. Sci., 11:* No. 1993, 1958.

26685. Gdalia, I.: Urinary fluorine levels of children and adults. *J. dent. Res., 37:* 601-604, 1958. Abstr: *Chem. Abstr., 52:* No. 20500, 1958.

26686. Hagen, J. M., E. G. Ball, and O. Cooper: Studies on the metabolism of adipose tissue. II. The effect of changes in the ionic composition of the medium upon the response to insulin. *J. biol. Chem., 234:* 781-786, 1959.

26687. Hevelke, G., and W.-E. Goldhahn: Die Gewebsatmung der Aortenwand bei Kälbern und Rindern. *Z. Altersforsch., 12:* 330-336, 1959.

26688. Kirk, J. E.: The adenylpyrophosphatase, inorganic pyrophosphatase, and phosphomonoesterase activities of human arterial tissue in individuals of various ages. *J. Geront., 14:* 181-188, 1959.

26689. Lajtha, A.: Amino acid and protein metabolism of brain. II. Uptake of L-lysine by brain and other organs of mouse at different ages. *J. Neurochem., 2:* 209-215, 1958. Abstr: *Biol. Sci., 11:* No. 1993, 1958.

26690. Malm, O. J.: *Calcium requirement and adaptation in adult men.* Oslo Univ. Press, Oslo, 1958, xii, 290 pp.

26691. Masetto, I., and S. Cortesi: Il metabolismo della zinco plasmatico et eritrocitario nei vecchi normali e nei vecchi anemici. *Acta med. patav., 17:* 483-498, 1958.

26692. Méhes, I., and L. Décsi: Diminution de l'activité acétylcholinestérasique dans la vieillesse. *C. R. Soc. Biol., Paris, 152:* 688-689, 1958.

26693. Ries, W.: Beitrag zum Kohlenhydratstoffwechsel der Fettsüchtigen. *Z. ges. innere Med., 12:* 501-504, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 345, 1959.

26694. Shirley, R. L., and G. K. Davis: Effect of dietary protein, vitamin E and age on the lactic dehydrogenase and succinoxidase of the hearts of rats. *J. Nutrit., 67:* 635-643, 1959.

26695. Tonna, E. A.: Post-traumatic variations in phosphatase and respiratory enzyme activities of the periosteum of aging rats. *J. Geront., 14:* 159-163, 1959.

26696. Weinbach, E. C., and J. Garbus: Oxidative phosphorylation in mitochondria from aged rats. *J. biol. Chem., 234:* 412-417, 1959.

26697. Woodford-Williams, E., and D. Webster: An anabolic study with norethandrolone in four elderly underweight males. *Brit. med. J.*, —: (5110), 1447-1450, 1958.

See also No. 27002.

VI. Nutrition

26698. Ayot, A.: Le régime alimentaire des vieillards hospitalisés vu par un directeur d'hospice. *Rev. franç. Géront., 4:* 302-306, 1958.

26699. Beveridge, J. M. R.: Role of unsaturated fat in adult nutrition. *Amer. J. publ. Hlth., 47:* 1370-1380, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 416, 1959.

26700. Browe, J. H.: Food shapes our future. *N. Y. St. J. Med., 58:* 738-741, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 418, 1959.

26701. Dolan, I. L.: Dessert puts appeal in meals for the aged. *Mod. Hosp., 92:* 106, 1959.

26702. Goglia, G.: L'impiego della dietilamide-carbopiridiana e sue associazioni in campo geriatrico. *Gaz. med. ital., 117:* 449-451, 1958.

26703. Griffith, W. H.: Senior citizens. Chap. 6 *in: Proceedings of the Borden Centennial Symposium on Nutrition.* The Borden Company Foundation, Inc., New York, 1958, pp. 85-97.

26704. Gsell, D.: Untersuchungen über die Ernährung von 100 alten Menschen in der Schweiz; vorläufiger Bericht. *Int. Z. VitaminForsch., 29:* 127-133, 1958.

26705. Markov, V. N.: (Aging and nutrition in light of the correlation between man and microbe.) *Izv. mikrobiol. inst., Sofia, 8:* 641-651, 1957.

26706. Mei Yu Dju, —., K. E. Mason, and L. J. Filer, Jr.: Vitamin E (tocopherol) in human tissues from birth to old age. *Amer. J. clin. Nutrit., 6:* 50-60, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 162, 1959.

26707. Morrison, L. M.: *The low-fat way to health and longer life.* Prentice-Hall, Englewood Cliffs, N. J., 1958. Abstr: *Maturity, 5:* (4), 23, 1958.

26708. Nebeț, H., and R. W. Steinbach: Vitamintherapie im Alter. *Ther. Gegenw., 97:* 435-436, 1958.

26709. Reynolds, M. M.: A nutrition program for older people. *Geriatrics, 14:* 190-193, 1959.

26710. Tauber, S. A., B. F. Chow, and R. S. Goodhart: Absorption of vitamin B_{12} in the aged. *Geriatrics, 14:* 244-246, 1959.

See also Nos. 26733, 26751, 26783, 26893, 26930.

VII. Parental Age

26711. Aslanyan, M. M., and M. Aslanyan: (Effect of parental age on the quality of the offspring.) *Zh. obsh. biol., Moskva, 19:* 226-233, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 327, 1959.

26712. Fuller, C. A., and L. C. Strong: Maternal age selection and the fertility of mice. *J. Geront., 14:* 156-158, 1959.

26713. Goodman, N.: Relation between maternal age at parturition and incidence of mental disorder in the offspring. *Brit. J. prev. soc. Med., 11:* 203-213, 1957. Abstr: *P. I., 25:* No. 1386, 1959.

26714. Hertoft, P., L. Leinøe, and H. Simonsen: Etiological factors of cryptogenic epilepsy, especially the importance of mother's age at the birth of the patient and the patient's place in the series of siblings. *Acta psychiat. neur. scand., 33:* 296-302, 1958.

X. Theories

26715. Kuhn, W.: Possible relation between optical activity and aging. *Adv. Enzymol., 20:* 1-29, 1958.

26716. Lüth, P.: Über die Ursache des Alterns. *Hippokrates, 29:* 650-655, 1958.

26717. Still, J. W.: The physiology of aging; a research approach. *J. Wash. Acad., Sci., 48:* 224-229, 1958.

25718. Szilard, L.: On the nature of the aging process. *Proc. nat. Acad. Sci., Wash., 45:* 30-45, 1959.

25719. Tamplin, A. R.: Quantitative aspects of the relationship of biological measurements to aging processes. *J. Geront., 14:* 134-155, 1959.

ORGAN SYSTEMS

I. Blood

26720. Andrejević, M., S. Stankovic, and M. V. Stevanovic: (Etiological aspects of anemias in the aged.) *Med. glasn., 12:* 267-271, 1958.

26721. Benedetti, G., and P. Ulivieri: L'anemia perniciosa, malattia presenile e senile. *Gior. Geront., 6:* 965-970, 1958.

26722. Börner, W., H. Bracharz, and J. Schröder: Über das Verhalten der zirkulierenden Blutzellen im Greisenalter. *Z. Altersforsch., 12:* 336-340, 1958.

26723. Braun, O. H., P. Bock, and O. Lüderitz: Altersbedingte Unterschiede in der Empfindlichkeit menschlicher Erythrocyten gegenüber Lipopolysacchariden aus *E. coli. Z. Kinderheilk., 81:* 503-508, 1958.

26724. Brüschke, G., and H. H. Hennemann: Die Bestimmung der Erythrocytenlebensdauer bei Leukosen mit Radiochrom (Cr 51), nebst methodischen Studien zur Chrommarkierung der Erythrocyten. *Dtsch. Arch. klin. Med., 205:* 263-275, 1958.

26725. Croizat, P.: Naissance, vie et mort du globule rouge; introduction à l'étude des anémies. *Rev. méd. moyen Orient, 15:* 381-389, 1958.

26726. Gingold, N.: L'aspect hématologique de la vieillesse. I. Considérations préliminaires. *Sang, 29:* 230-237, 1958.

26727. Gingold, N.: L'aspect hématologique de la vieillesse. VII. Considérations finales discussion des résultats, conclusion. *Sang, 29:* 327-337, 1958.

26728. Gingold, N., C. Cutcudache, and S. Balan: L'aspect hématologique de la vieillesse. V. Facteurs de groupe sanguin et problèmes d'immunité. *Sang, 29:* 323-325, 1958.

26729. Gingold, N., A. Podhorschi, C. Cutcudache, F. Enach-Ciuntu, and A. Balan: L'aspect hématologique de la vieillesse. II. Le sang périphérique. *Sang, 29:* 237-242, 1958.

26730. Hansen, E. C.: (Macrocytic anemia in aged. I. Blood and bone marrow changes in normal persons of advanced age.) *Nord. Med., Stockholm, 60:* 1416-1418, 1958.

26731. Hansen, E. C., and H. Gormsen: (Macrocytic anemia in aged. II. Blood and bone marrow changes in 65 elderly anemia patients.) *Nord. Med., Stockholm, 60:* 1418-1422, 1958.

26732. Kauchtschischwili, G. M.: Il test sulla resistenza leucocitaria nel vecchi e suoi rapporti con la disprotidemia e ipercolesterolemia. *Gior. Geront., 6:* 976-986, 1958.

26733. Lange, H. F., and O. Skjaeggestad: Iron deficiency anemia in old age. *Acta med. scand., 162:* 321-326, 1958.

26734. Löhr, G. W., H. D. Waller, O. Karges, B. Schlegel, and A. A. Müller: Zur Biochemie der Alterung menschlicher Erythrocyten. *Klin. Wschr., 36:* 1008-1013, 1958.

26735. Lucia, S. P., M. L. Hunt, and N. L. Petrakis: The leukemias in relation to age, sex, and blood group. *Vox sang., 3:* 354-362, 1958.

26736. Mattioli, G., C. De Rubertis, and A. Pierangeli: Sulla massa sanguigna ed alcune sue costanti nel malato chirurgico di oltre 60 anni. *Minerva chirurg., 13:* 1139-1147, 1958.

26737. Meeus-Bith, L., and Y. Najean: Calcul de la durée de vie des hématies par la méthode de marquage au chrome radio-actif. *Rev. franç. clin. biol., 3:* 795-798, 1958.

26738. Miescher, P., H. Berger, A. Gilardi, and O. Hegglin: Die Lebensdauer von Cr51-markierten Erythrocyten in verschiedenen Lebensaltern. *Strahlentherapie,* —: (Suppl. 38), 236-243, 1958.

26739. Prankerd, T. A.: The ageing of red cells. *J. Physiol., 143:* 325-331, 1958.

26740. Reynafarje, C.: Red cell life span in newborn at sea level and high altitudes. *Proc. Soc. exp. Biol., N. Y., 100:* 256-258, 1959.

26741. Schleyer, F.: (Postmortem blood viscosity, blood cell volume, osmotic erythrocyte resistance and blood sedimentation in relation to cadaver age and cause of death.) *Virchows Arch., 331:* 276-286, 1958.

26742. Smith, R. H.: Normal blood volumes in men and women over sixty years of age as determined by a modified Cr51 method. *Anesthesiology, 19:* 752-756, 1958.

26743. Vignon, G.: Contribution à l'étude de la sédimentation sanguine et de l'électrophorèse chez le vieillard normal; étude de cent cas. *Lyon méd., 90:* 729-732, 1958.

26744. Wood, E. E.: Blood diseases in old age. *Med. Pr., 240:* 624-627, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 368, 1959.

See also Nos. 26595, 26691, 26758.

I-A. BLOOD: *Chemistry*

26745. Billeri, I., and G. F. Ferretti: Rilievi sul ricambio lipoproteico nel vecchio. *Gior. Geront., 6:* 71-75, 1958.

26746. Blanco-Soler, C., J. De la Hoz, and C. Duran: Estudio electroforético del viejo. *Rev. Ibér. Endocrinol., 5:* 525-535, 1958.

26747. Brunner, D., G. Manelis, and K. Loebl: Ethnological study of the age trend of serum lipids; preliminary report. *Israel med. J., 17:* 177-182, 1958.

26748. Carinci, M. P., A. Abate, and A. Abbati: Il quadro elettroforetico nel vecchio colpito della recente epidemia influenzale. *Gior. Geront., 6:* 1010-1026, 1958.

26749. Cattaneo, R., E. Levi, and C. Prinotti: Acido tioctico e modificazioni di alcuni aspetti del ricambio lipidico in cardioangiopatici aterosclerotici. *Acta geront., 8:* 123-140, 1958.

26750. Goldbloom, A. A., H. B. Eiber, and I. Danishefsky: Newer clinical and laboratory studies in the aged. XV. Changing lipoprotein patterns in the aged; a follow-up study. *J. Geront., 12:* 292-295, 1957.

26751. Hollister, L. E., and F. S. Glazener: Serum lipid levels in geriatric patients treated with a dietary supplement of unsaturated fatty acids. *J. Amer. geriat. Soc., 7:* 327-334, 1959.

26752. Keitel, W.: Das C-reaktive Protein im Alter und bei Gefässleiden. *Z. ges. innere Med., 13:* 591-596, 1958.

26753. Renkonen, K. O.: Precipitation of serum proteins with anti-sera and sulfosalicylic acid; studies in different age groups. *Ann. Med. exp. Biol. Fenn., 36:* 68-74, 1958.

26754. Tokuda, M.: Die Korrelation zwischen der Höhe des Blutdruckes und der Konzentration des nach der Viktoriablaufiltrierpapier methode bestimmbaren Lipoides im Blutplasma. *Arch. Histol. Jap., 13:* 259-261, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 166, 1959.

26755. Véziris, C. D.: L'histaminémie chez la femme ménopausée ou castrée. *Sem. Hôp. Paris, 34:* 1309-1312, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 349, 1959.

See also Nos. 26680, 26683, 26722, 26743, 26821, 26824.

I-B. BLOOD: *Coagulation*

26756. Gingold, N., and A. Podhorschi: L'aspect hématologique de la vieillesse. VI. Recherches sur quelques facteurs de l'hémostase. *Sang, 29:* 326-327, 1958.

26757. Péquignot, H., C. H. Boyer, and M. Tribouilloy: Le traitement anticoagulant chez les grands vieillards. *Concours méd., 81:* 31-38, 1959.

II. BLOOD FORMING & DESTROYING ORGANS

26758. Gingold, N., C. Cutcudache, I. Goresco, and A. Podhorschi: L'aspect hématologique de la vieillesse. III. La moelle osseuse. *Sang, 29:* 243-246, 1958.

26759. Mantz, J. M., and P. Métais: Variations cytologiques quantitatives de la moelle osseuse du rat blanc dans diverses circonstances physiologiques. *C. R. Soc. Biol., Paris, 151:* 2196-2199, 1957.

26760. Tischendorf, F.: Über die Hippopotamidenmilz; ein Beitrag zur Typen- und Altersanatomie der Säugermilz. *Z. mikr.-anat. Forsch., 64:* 228-257, 1958.

See also Nos. 26730, 26731.

III. CARDIOVASCULAR SYSTEM

(blood vessels, blood pressure, hypertension, blood volume, veins, and arteriosclerosis)

26761. Casassa, P. M., and V. Maccotta: Sul comportamento dei gradienti di pressione e di indice oscillometrico omero-tibiali nelle persone anziane. *Gior. Geront., 7:* 120-132, 1959.

26762. Caviglia, E., G. Franco, and L. Garello: Il circolo periferico nel vecchio; studio pletismografico. *Arch. "E. Maragliano", 14:* 1247-1257, 1958.

26763. Dack, S. (Moderator), M. Landowne, A. A. Luisada, J. H. Bland, and R. Harris (Panelists): Panel discussion on problems in the diagnosis and management of cardiovascular disease. *J. Amer. geriat. Soc., 7:* 221-239, 1959.

26764. de Crinis, K., W. Redisch, A. Antonio, A. Bogdanovitz, and J. M. Steele: Vasomotor responses to cooling in the extremities of subjects with neurologic lesions. *Circulation, N. Y., 19:* 583-589, 1959.

26765. Di Gaeta, S.: Segni di particolare rilievo nella semeiotica roentgen delle arteriopatie senili. *Rif. med., 72:* 1036-1044, 1958.

26766. Doubleday, L. C.: Radiological aspects of carotid artery syndrome. *Geriatrics, 14:* 219-223, 1959.

26767. Frignani, L., and L. Righetti: Osservazioni anatomo-radiografiche sulla senilizzazione delle arterie del pene. *Ateneo parmense, 29:* 134-143, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 321, 1959.

26768. Garello, L.: Il controllo socillografico della prova dell'iperemia reattiva nei soggetti sani in giovane e tarda età. *Arch. "E. Maragliano", 14:* 1273-1280, 1958.

26769. Gibertini, G., R. Vecchiati, and G. Martinelli: Considerazioni sul trattamento chirurgico delle vasculopatie periferiche degli arti inferiori. Risultati clinici immediati ed a distanza in 114 gangliectomie del simpatico lombare. *Boll. Soc. med.-chir., Modena, 57:* 896-926, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 395, 1959.

26770. Jouve, A.: Sur l'athérosclérose sénile. *Rev. franç. Géront., 4:* 189-191, 1958.

26771. Losse, H., and F. Hinsen: Untersuchungen über die Häufigkeit verschiedener Hochdruckformen bei 3340 Hypertonikern. *Z. KreislForsch., 47:* 39-50, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 364, 1959.

26772. Movat, H. Z., R. H. More, and M. D. Haust: The diffuse intimal thickening of the human aorta with aging. *Amer. J. Path., 34:* 1023-1031, 1958.

26773. Padmavati, S., and S. Gupta: Blood pressure studies in rural and urban groups in Delhi. *Circulation, N. Y., 19:* 395-405, 1959.

26774. Padovan, Q.: Permeabilità capillare negli anziani. *Arcisped. S. Anna di Ferrara, 11:* 625-633, 1958.

26775. Prati, P. L., S. Signorelli, A. Rivi, and A. Fontanini: Valutazione del "tempo di cresta" sul polso di pressione aortico addominale, quale indice di sclerosi vascolare. *Acta geront., 8:* 177-184, 1958.

26776. Redisch, W., K. de Crinis, A. Antonio, A. Bogdanovitz, and J. M. Steele: Vasomotor responses to exercise in the extremities of subjects with vascular disease. *Circulation, N. Y., 19:* 579-582, 1959.

26777. Ring, G. C., T. Kurbatov, and G. J. Shannon: Changes in central pulse and finger plethysmography during aging. *J. Geront., 14:* 189-191, 1959.

26778. Ruol, A., L. Menozzi, I. Masetto, and C. Drudi: Sulla fisiopatologia della circolazione arteriolocapillare e degli scambi emato-tessutali nel vecchio. *Gior. Geront., 7:* 103-112, 1959.

26779. Sallstrand, M.: (Treatment of essential hypertension in aged.) *Nord. Med., Stockholm, 60:* 1671-1673, 1958.

26780. Schulz, F. H., and G. Schrödter: Alternsabhängige Reaktionen beim Empfänger nach Bluttransfusionen. I. Mitteilung; das Verhalten des Gesamteiweissgehaltes im Blutserum beim Empfänger. *Z. Altersforsch., 13:* 53-60, 1959.

26781. Seyss, R.: Zur Arteriosklerose an der oberen Extremität. *Z. Altersforsch., 12:* 326-330, 1959.

26782. Steenhouwer, B., P. Graux, and J. Lefebvre: Le vieillard agé de plus de 90 ans. étude de l'appareil circulatoire. *Lille méd., 2:* 677-684, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 356, 1959.

26783. U. S. Department of Health, Education and Welfare. Public Health Service. National Institutes of Health. National Heart Institute. Analysis and Reports Section. Grants and Training Branch. (Prepared for the National Advisory Heart Council by May Sherman): *Diet, hormones, and atherosclerosis; a review of research grants supported by the National Heart Institute for fiscal years 1949-1958.* U. S. Govt. Print. Office, Washington, 1959, 97 pp. (Mimeogr.).

See also Nos. 26595, 26687, 26688, 26754, 26811, 26989.

III-G. Cardiovascular System: *Heart*

(heart, anatomy and physiology, heart disease, coronary artery disease, and myocardial disease)

26784. Antoci, B.: La calcificazione degli anelli fibrosi valvolari quale fenomeno distrofico senile del cuore. *G. veneto Sci. med., 12:* 167-179, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 174, 1959.

26785. Balduzzi, G., M. Melis, and G. Benedetti: Introduzione allo studio arteriografico del circolo cardiaco normale et in particolari condizioni sperimentali e patologiche con speciale riguardo alle anastomosi intercoronariche. *Arch. ital. Chir., 82:* 437-504, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 322, 1959.

26786. Baroldi, G.: Il circolo settale dei cuori normali e patologici in rapporto ai diversi tipi di vascolarizzazione. *Folia angiol., 4:* 8-36, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 323, 1959.

26787. Boman, A.: (ECG in 90 year old persons.) *Nord. Med., Stockholm, 60:* 1673-1674, 1958.

26788. Bonard, E. C., and V. Sears: L'électrocardiogramme des octogénaires. *Rev. Méd. Suisse rom., 78:* 683-694, 1958.

26789. Constantinides, P., and J. Rutherdale: Effects of age and endocrines on the mast cell counts of the rat myocardium. *J. Geront., 12:* 264-269, 1957.

26790. Erez, B. M.: Nerves of human heart. *C. R. Acad. Sci. U.R.S.S. (Dokl.), 17:* 87-94, 1956. Abstr: *Biol. Sci., 11:* No. 1675, 1958.

26791. Garello, L., G. Bertola, and E. Caviglia: Ricerche sulla durata della sistole elettrica nell'età senile. *Arch. "E. Maragliano", 14:* 859-866, 1958.

26792. Griffith, G. C.: Ions and their relationship to heart muscle; a general survey of ion concentration. *Ann. N. Y. Acad. Sci., 72:* 390-395, 1959.

26793. Kennedy, A. C.: Observations on the incidence of coronary heart disease in a rural area in South-West Scotland. *Scot. med. J., 2:* 420-424, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 360, 1959.

26794. Klein, F., V. Dornetzhuber, and J. Laifer: Mitralstenose älterer Leute. *Zbl. allg. Path. path. Anat., 98:* 89-101, 1958.

26795. Kohn, R. R., and E. Rollerson: Age changes in swelling properties of human myocardium. *Proc. Soc. exp. Biol., N. Y., 100:* 253-256, 1959.

26796. McGavack, T. H., K. T. Tao, D. A. Leake, H. G. Bauer, and H. E. Berger: Clinical experiences with triamcinolone in elderly men. *Amer. J. med. Sci., 236:* 720-735, 1958. Abstr: *Geriatrics, 14:* 68A; 70A, 1959.

26797. Roberts, L. N.: Cardiac infarction in Victoria, B. C. *Canad. med. Ass. J., 77:* 686-691, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 361, 1959.

26798. Rona, G., C. I. Chappel, T. Balazs, and R. Gaudry: The effect of breed, age, and sex on myocardial necrosis produced by isoproterenol in the rat. *J. Geront., 14:* 169-173, 1959.

26799. Selye, H., and E. Bajusz: The age factor in the production of various experimental cardiopathies. *J. Geront., 14:* 164-168, 1959.

26800. Soehardo, K.: (Incidence of heart disease as based on admissions to the Djakarta Central Hospital during 1956.) *J. Indon. med. Ass., 8:* 29-37, 1958.

26801. Winsor, T., and H. L. Karpman: Self-regulating prophylactic regimen for angina pectoris. *J. Amer. geriat. Soc., 7:* 335-338, 1959.

See also Nos. 26617, 26749, 26848.

IV. Connective Tissue & Cartilage

26802. Banfield, W. G.: Effect of growth hormone on acetic acid-extractable collagen of hamster skin. *Proc. Soc. exp. Biol., N. Y., 97:* 309-312, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 149, 1959.

26803. Boucek, R. J.: Aging of cells. *In: VA Prospectus; Research in Aging.* U. S. Govt. Print. Office, Washington, 1959, pp. 43-62.

26804. Bucciante, G.. and L. Gotte: Ricerche morfochimiche sull'elastina senile. *Arch. Sci. biol., Bologna, 42:* 490-494, 1958.

26805. Delaunay, A., and S. Bazin: Le métabolisme du collagène. II. L'anabolisme à la lumière des données physiologiques. *Rev. franç. clin. biol., 3:* 1001-1010, 1958.

26806. Elden, H. R.: Effect of cross linking by formaldehyde on the contraction-relaxation of rat tail tendon. *Nature, Lond., 183:* 332-333, 1959.

26807. Gersh, I.: Aging of molecules; aging and ground substance of connective tissue. *In: VA Prospectus; Research in Aging.* U. S. Govt. Print. Office, Washington, 1959, pp. 5-41.

26808. Kobrle, V., and M. Chvapil: Veränderungen von Kollageneiweisstoffen im Verlaufe des Alterns und bei der experimentellen Silikose. *Arch. Gewerbepath. Gewerbehyg., 16:* 526-538, 1958.

See also Nos. 26706, 26795, 26843, 26864, 26877.

V. Endocrine System

(includes sex glands and climacteric)

26809. Albeaux-Fernet, M.: L'exploitation fonctionnelle du cortex surrenal chez le sujet agé; techniques et résultats. *Rev. franç. Géront., 5:* 13-15, Feb. 1959.

26810. Arata, L., and L. di Girolamo: Contributo alla conoscenza del metabolismo dell'estradiolo, nei soggetti vecchi in confronto dei soggetti giovani. *Gior. Geront., 6:* 987-998, 1958.

26811. Azzali, G.: Ricerche anatomo-radiografiche sulla senescenza delle vene del testicolo dell'uomo. *Biol. latina, 11:* 643-661, 1958.

26812. Bigelow, B.: Comparison of ovarian and endometrial morphology spanning the menopause. (Abstr.). *Obstet. Gynec., 11:* 487, 1958.

26813. Botar, J.: Physiologisch-morphologische Untersuchungen über die Innervation des Nebennierenmarks beim Hund; Veränderungen der Organinnervation in Beziehung zum Alter, zu experimentellen Einwirkungen auf den Organismus und zu Krankheiten. *Acta anat., Basel, 35:* (Suppl. 1), 1-88, 1958.

26814. Bürger, M., and K. Seidel: Die Biomorphose des Endokriniums. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 97-110.

26815. Chierici, F., G. Cussini, and B. Vancini: Contributo clinico alla conoscenza della sindrome da "ipermedullismo surrenale senile". *Gior. Geront., 6:* 999-1009, 1958.

26816. Chierici, F., G. Cussini, and B. Vancini: L'ipermedullismo surrenale ad impronta ipertiroidea frusta nel vecchio. *Gior. Geront., 7:* 13-67, 1959.

26817. Concepción Guerra, C.: Síndrome vascular-pancreático en el viejo. *Med. clin. Barcelona, 30:* 42-43, 1958. Abstr: *Excerpta Medica, 2:* (Section 20), No. 379, 1959.

26818. di Girolamo, L.: La semeiologio ormonale in vecchiaia. *Riv. Geront. Geriat., 7:* 231-278, 1958.

26819. Dorfman, R. I.: Steroid hormones and ageing. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 111-119.

26820. Drey, N. W., B. L. Taussig, J. Waterfield, and R. Rubin: Chlorpropamide in the management of the adult diabetic patient. *Ann. N. Y. Acad. Sci., 74:* 962-970, 1959.

26821. Indovina, D.: Variazioni della concentrazione ematica dell'acido ascorbico dopo somministrazione di ACTH nei soggetti anziani. *Acta geront., 8:* 196-201, 1958.

26822. Isler, H., C. P. Leblond, and A. A. Axelrad: Influence of age and of iodine intake on the production of thyroid tumors in the rat. *J. nat. Cancer Inst., 21:* 1065-1081, 1958.

26823. Kaiser, R.: Über den pathologischen Cyclus der Frau nach dem 30. Lebensjahr. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alterden Menschen.* Springer-Verlag, Berlin, 1958, pp. 147-151.

26824. Klein, E.: Altersveränderungen der Schilddrüse. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 219-230.

26825. Nielsen, K.: (Treatment of aged diabetics with carbutamide.) *Ugesk. Laeg., 120:* 1056-1058, 1958.

26826. Nowakowski, H., and H. Schmidt: Das Altern der männlichen Keimdrüsen. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 207-214.

26827. Onnis, A., and F. Dalla Costa: Studi sulla patologia del surrene. III. Sul peso e sul volume delle ghiandole surrenali umane in rapporto a diversi stati fisiologici e patologici. *Riv. Anat. Patol., 13:* 1119-1147, 1958.

26828. Parhon, C. I., D. Postelnicu, V. Sahleanu, and I. Petrea: Observasii asupra morfologiei microscopice a epifizei umane in raport cu virsta. *Stud. Cercet. Endocr., 8:* 311-314, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 325, 1959.

26829. Pedersen, J., and N. I. Nissen: (Incidence and classification of glycosuria in hospital for elderly patients without severe symptoms of diabetes; incidence of partial diabetes in a medical ward.) *Ugesk. Laeg., 120:* 1319-1323, 1958.

26830. Pena, N. V.: Geriatria. Climaterio masculino. *Galicia clin.*, 30: 503-504, 1958.

26831. Pereira Barretto, M., P. Valentie de Oliveira, H. Zago, Jr., W. Marques, J. Mendonça, J. Saquis, J. Guimarães, and E. Vila: Contribuição para o estudo de Tricomonadiase vaginal. III. Ocorrencia da infecção em mulheres após a menopausa. *Rev. Asoc. med. brasil., 4:* 48-53, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 397, 1959.

26832. Reynolds, F. W.: Hormonal alterations with aging. *Postgrad. Med., 24:* 624-626, 1958.

26833. Romanoff, L. P., R. M. Rodriguez, J. M. Seelye, C. Parent, and G. Pincus: The urinary excretion of tetrahydrocortisol, 3d-allotetrahydrocortisol and tetrahydrocortisone in young and elderly men and women. *J. clin. Endrocrinol., 18:* 1285-1295, 1958.

26834. Ruhrmann, H., and K. H. Schulten: Oestrogenexkretion im Urin bei normalen Männern in verschiedenen Lebensaltern im Vergleich zur Androgenausscheidung. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 215-218.

26835. Schulz, F. H.: Die Wechselbeziehungen zwischen Klimakterium und inneren Krankheiten. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 152-160.

26836. Seidel, K.: Alters- und Geschlechtsverteilung endokrinologischer Erkrankungen. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 231-237.

26837. Silló, G.: Komplexhormon bei Menopause und Hypertonie. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 53-57.

26838. Tervilä, L.: The weight of ovaries after stress ending in death. *Ann. Chir. Gynaec. Fenn., 47:* (Suppl. 81), 232-244, 1958.

26839. Treves, G.: Seminomi in due osservazioni di soggetti ultrasetantenni. *Arch. De Vecchi, 28:* 757-771, 1958.

26840. Vague, J., M. Legré, and J. Allignol: Le rôle des hormones dans le vieillissement humain. *Rev. franç. Géront., 4:* 167-168; 171-174; 177-182, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 346, 1959.

26841. Wenner, R., and G. A. Hauser: Die Umstellung der innersekretorischen Drüsen bei der alternden Frau und ihre Folgen für den Organismus. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 120-140.

26842. Würterle, A.: Zur Altersabhängigkeit der Ausscheidung von 17-Ketosteroiden bei der Frau. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 141-146.

See also Nos. 26697, 26755, 26783, 26854, 27001, 27002, 27159.

VI. Gastro-Intestinal Tract

26843. Bilek, K., W. Mischel, K. Piskazeck, and K. Rothe: Der Mangangehalt der menschlichen Leber in Abhängigkeit vom Lebensalter und Geschlecht. *Z. Altersforsch., 13:* 23-32, 1959.

26844. Dubarry, J. J.: L'ulcère digestif tardif. *Maroc méd., 37:* 891-895, 1958.

26845. Friedman, A. I.: Peptic ulcer in the elderly. *Amer. J. Gastroenter., 31:* 15-22, 1959. Abstr: *Geriatrics, 14:* 62A; 64A, 1959.

26846. Nugent, F. W.: Regional ileitis with onset in patients over fifty years of age. *Gastroenterology, 35:* 418-419, 1958.

26847. Priola, I.: L'occlusione intestinale nei vecchi. *Minerva chirurg., 13:* 881-886, 1958.

26848. Schmidt, K., and E. Berger: Geriatrischer Beitrag zur Gallensäurebehandlung bei Herz- und Kreislaufstörungen. *Wien. med. Wschr., 108:* 816-817, 1958.

26849. Schneider, G.: Zur Symptomatik von Erkrankungen des Parodontiums und der Mundschleimhaut im Alternsablauf bei Frauen. *Z. Altersforsch., 12:* 340-355, 1959.

26850. Serino, G. S.: Gallstone ileus in a 95-year-old woman; a case report with six-year follow-up studies. *Geriatrics, 14:* 257-262, 1959.

26851. Smigel, J. O., K. J. Lowe, P. H. Hosp, and J. H. Gibson: Constipation in elderly patients; treatment with dioctyl sodium sulfosuccinate and dioctyl sodium sulfosuccinate plus peristim. *Med. Times, N. Y., 86:* 1521-1526, 1958.

26852. Solez, C.: Prolonged course of untreated gastric neoplasm; report of a case in a 70-year-old man. *Geriatrics, 14:* 252-256, 1959.

26853. Vaughn, A. M., M. S. White, C. M. Annan, J. A. Caserta, and J. M. Coleman: Herniorrhaphy in an advanced age group. *Amer. J. Surg., 97:* 69-74, 1958. Abstr: *Geriatrics, 14:* 67A, 1959.

See also Nos. 26596, 27145.

VII. Kidney

26854. Dicker, S. E., and J. Nunn: Antidiuresis in adult and old rats. *J. Physiol., 141:* 332-336, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 160, 1959.

26855. Foulkes, E. C., and B. F. Miller: Transport of p-aminohippurate from cell to lumen in kidney tubule. *Amer. J. Physiol., 196:* 83-85, 1959.

26856. Foulkes, E. C., and B. F. Miller: Steps in p-aminohippurate transport by kidney slices. *Amer. J. Physiol., 196:* 86-92, 1959.

26857. Macgregor, G. A., and H. Wagner: The influence of age on excretion of radioactive iodine. *Lancet, 2:* 612-614, 1958.

26858. Teramo, A., and A. Benegiamo: Alcuni aspetti della funzionalità renale nell'età senile. *G. ital. Chir., 14:* 1015-1028, 1958.

See also No. 26617.

VIII. Lymphatic System

26859. Piskunova, E. D.: Nerve endings in palatal tonsils of man and certain animals. *Russk. Arkh. Anat.*, 33: 67-68, 1956. Abstr: *Biol. Sci., 11:* No. 1672, 1958.

IX. Muscular System

26860. Berg, B. N.: Study of vitamin E supplements in relation to muscular dystrophy and other diseases in aging rats. *J. Geront., 14:* 174-180, 1959.

26861. Boström, H., and R. Hed: Thyrotoxic myopathy and polymyositis in elderly patients; differential-diagnostic viewpoints. *Acta med. scand., 162:* 225-230, 1958.

26862. Latyshev, V. A.: (New formation processes in skeletal musculature of man and mammals.) *Uchen. zapiski Krasnodar ped. Inst., 14:* 47-56, 1955. Abstr: *Biol. Sci., 11:* No. 1742, 1958.

26863. Müller, E. A.: Training muscle strength. *Ergonomics, 2:* 216-222, 1959.

26864. Orlova, I. I.: Effect of functional loading on age changes in histological structure of skeletal muscles of cattle. *Russ. Arkh. Anat., 32:* 27-34, 1955. Abstr: *Biol. Sci., 11:* No. 1743, 1958.

26865. Recordier, —., and —. Baumgartner: Sur la sénescence de l'appareil locomoteur. *Rev. franç. Géront., 4:* 199-201, 1958

See also Nos. 26600, 26617.

X. Nervous System
(neurology)

26866. Adams, A.: Studies on the flat electroencephalogram in man. *Electenceph. clin. Neurophysiol., 11:* 35-41, 1959.

26867. Alvarez, W. C.: Strokes due to thrombosis of the internal carotid artery. (Editorial.) *Geriatrics, 14:* 201-202, 1959.

26868. Ambrozi, L., and W. Birkmayer: Über die Differenzierung zwischen postencephalitischem Parkinsonismus und Morbus Parkinson im Formdeutversuch nach Rorschach. *Nervenarzt, 29:* 319, 1958. Abstr: *J. Amer. geriat. Soc., 7:* 368, 1959.

26869. Bondareff, W.: Research on morphologic changes in the aging nervous system. *Sth. med. J., Birmingham, 51:* 1292-1295, 1958.

26870. Chafetz, M. E.: Treatment of Parkinson's disease; A. Psychotherapy in Parkinson's disease. (Abstr.). *Arch. Neurol. Psychiat., Chicago, 77:* 271-272, 1957.

26871. Chiaramonti, E.: Considerazioni critiche sull'interprétazione patogenetica della paraparesi e della paraplegia flaccida, a lenta insorgenza, dei vecchi. *Riv. Patol. nerv. ment., 79:* 41-53, 1958.

26872. Destrem, H., and R. Bargues: A propos de trois observations de neuro-pathologie gériatrique. Considérations pathogéniques et thérapeutiques générales. *Rev. franç. Géront., 4:* 113-123, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20). No. 245, 1959.

26873. Fields, W. S. (Editor): *Sixth annual scientific meeting of the Houston Neurological Society.* The Author, Div. of Neurol., Baylor Univ., Waco, 1958, 384 pp.

26874. Gal, P.: Craniopharyngiomas in aged mental patients. *Geriatrics, 14:* 150-152, 1959.

26875. Gal, P.: Mental disorders of advanced years. *Geriatrics 14:* 224-228, 1959.

26876. Giorgini, R.: Considerazioni sulla terapia delle apoplessie. *Minerva med., Torino, 49:* 3545-3549, 1958.

26877. Hallgren, B., and P. Sourander: The effect of age on the non-haemin iron in the human brain. *J. Neurochem., 3:* 41-51, 1958.

26878. Hempel, K. J., and M. Namba: Die Involution des Supranucleus *medialis-dorsalis*, sowie der Lamella *medialis* und der Lamella *interna thalami. J. Hirnforsch., 4:* 43-77, 1958.

26879. Konchegul, I.: The use of Kemadrin in the treatment of drug-induced parkinsonism. *Med. Ann. District of Columbia, 27:* 405-406, 1958. Abstr: *Geriatrics, 14:* 193, 1959.

26880. Kuhn, R. A.: Diagnostic considerations in patients with stroke. *Geriatrics, 14:* 135-149, 1959.

26881. McAdam, W. L., and R. A. Robinson: Psychiatric and electro-encephalographic studies in socially adjusted old people. *J. ment. Sci., 104:* 840-843, 1958.

26882. Millikan, C. H. (Editor): *Cerebral vascular disease.* Grune & Stratton, Inc., New York, 1958, 224 pp. Abstr: *Geriatrics, 14:* 34A; 37A, 1959.

26883. Morrison, L. R.: *The effect of advancing age upon the human spinal cord.* Harvard Univ. Press, Cambridge, 1959, x, 127 pp.

26884. Moyer, E. K., and B. F. Kaliszewski: The number of nerve fibers in motor spinal nerve roots of young, mature and aged cats. *Anat. Rec., 131:* 681-699, 1958.

26885. Mutrux, S.: Contribution à l'étude histologique différentielle de la démence sénile et da la maladie d'Alzheimer. *Psychiatria, Basel, 136:* 146-156, 1958.

26886. Nugent, C. A., H. W. Harris, J. Cohn, C. C. Smith, and F. H. Tyler: Dyspnea as a symptom in Parkinson's syndrome. (Abstr.). *Amer. Rev. Tuberc., 78:* 682-691, 1958.

26887. Perrot, R. M., M. Florentin, and C. Florentin: Perversities précoces et Parkinson tardif. *Ann. méd-psychol., 2:* 616-620, 1956. Abstr: *P. A. 32:* No. 3243, 1958.

26888. Purin, V. R.: (Glycogen of the choroid plexus and age factor in chemical composition of the cerebrospinal fluid.) *Vop. med. khimii, 4:* 345-350, 1958.

26889. Thormählen, P.: Encephalomyelitis post vaccinationem und Lebensalter. *Beitr. path. Anat., 119:* 285-300, 1958.

26890. Zlatitskaia, N. N.: (Peculiarities in ageing of motor nerve endings in the human tongue.) *Russk. Arkh. Anat., 33:* 35-40, 1956. Abstr: *Biol. Sci., 11:* No. 1739, 1958.

See also Nos. 26684, 26689, 27068, 27155.

XI. Reactions of the Body as a Whole

(allergy, anoxia, anesthesia, anthropometry, drugs, exercise, immunity, sleep, and temperature regulation)

26891. Astrand, I.: Clinical and physiological studies of manual workers 50-64 years old at rest and during work. *Acta med. scand., 162:* 155-164, 1958.

26892. Astrand, I.: Physiological methods for estimating the physical work capacity in workers especially of the older age groups. *Ergonomics, 1:* 129 136, 1958.

26893. Audier, M., and A. L. Milliat: La diététique dans le traitement des insomnies du vieillard. *Rev. franç. Géront., 5:* 45-46, Feb. 1959.

26894. Barbieri, G. C., and R. Lodi: Biotipologia senile e trauma anestetico. *Acta geront., 8:* 185-195, 1958.

26895. Breitbach, A.: Die Infektionsabwehr des Körpers unter Berücksichtigung des Lebensalters und des Geschlechts. *Z. Altersforsch., 12:* 305-312, 1959.

26896. Bryan, J. H. D., and J. W. Gowen: The effects of 2560 r of x-rays on spermatogenesis in the mouse. *Biol. Bull. Wood's Hole, 114:* 271-283, 1958.

26897. Carinci, M. P., A. Abbati, and A. Abate: Prime osservazioni sugli effetti della vaccinazione antivaioloso nel vecchio. *Gior. Geront., 7:* 166-170, 1959.

26898. Comfort, A.: Symposium C: Late effects of irradiation in mammals; natural aging and the effects of radiation. *Radiation Res.*, —: (Suppl. 1), 216-234, 1959.

26899. Cotes, J. E., and F. Meade: Physical training in relation to the energy expenditure of walking and to factors controlling respiration during exercise. *Ergonomics 2:* 195-206, 1959.

26900. Fertman, M. B.: Etiology of severe obesity; a study of five cases. *J. Amer. geriat. Soc., 7:* 38-50, 1959.

26901. Freeman, J. T.: The mechanisms of stress and the forces of senescence. *J. Amer. geriat. Soc., 7:* 71-78, 1959.

26902. Gomulka, J.: (Number of eosinophils in the blood of elderly persons in postoperative period.) *Polsk. Tygod. lek., 13:* 1321-1324, 1958.

26903. Hennessy, A. V., and F. M. Davenport: Epidemiological implications of distribution by age of antibody response to experimental influenza virus vaccines. *J. Immunol., 80:* 114-121, 1958. Abstr: *Biol. Sci., 11:* No. 4541, 1958.

26904. Hollmann, W., H. Venrath, and H. Valentin: Über das Verhalten von Ventilation und Stoffwechsel gesunder männlicher Personen verschiedenen Alters bei leichter und mittelschwerer Arbeit. *Z. Altersforsch., 13:* 60-67, 1959.

26905. Hursh, J. B., and G. W. Casarett: Recovery from a single dose of x-ray in old and young rats. *Amer. J. Physiol., 196:* 649-652, 1959.

26906. Johansen, O.: *Idrett og Alder.* Kirke- og Undervisningsdepartementet Statens Ungdoms- og Idrettskontor, Oslo, 1958, 112 pp.

26907. Karpinos, B. D.: Weight-height standards based on World War II experience. *J. Amer. Statist. Ass., 53:* 409-419, 1958.

26908. Karvonen, M. J.: Problems of training of the cardiovascular system. *Ergonomics, 2:* 207-215, 1959.

26909. Kenter, H., H. Loosen, and H. Joppen: Beobachtungen unter O_2-Mangel bei alten und jungen Menschen. *Z. Altersforsch., 13:* 41-53, 1959.

26910. Lachance, L. E.: Ingestion of ethylenediaminetetraacetic acid and the effect on life span of irradiated and control Habrobracon females. *Nature, Lond., 182:* 870-871, 1958.

26911. Lambrev, Z., and Z. Zlatarov: (Mortality of white mice of various ages following massive-dose x-irradiation.) *Suvrem. med., 9:* (8), 40-45, 1958.

26912. Lamson, B. G., R. A. Meek, and L. R. Bennett: Late effects of total body roentgen irradiation. II. The influence of fractionated and single radiation doses on the incidence of tumors, nephrosclerosis, and adrenal vacuolation in Wistar rats during various periods of post-irradiation survival. *Arch. Path., Chicago, 64:* 505-521, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 147, 1959.

25913. Merelo Anaya, A.: La hidroxidiona sódica (viadril), anestésico de eleccton en geriatria. *Med. Rev. mex., 38:* 537-540, 1958.

26914. Michel, D., O. Hartleb, and E. Marxhausen: Zur Frage einer Altersabhängigkeit des Strophanthineffektes beim Menschen. *Z. klin. Med., 155:* 288-309, 1958.

26915. Pauker, J. D.: A study of effects of sex hormones and reserpine on psychological functions in the aged. *Disserta. Abstr., 17:* 2316, 1957. Abstr: *P. A., 32:* No. 5290, 1958.

26916. Puech, A., and R. Labauge: Les hypersomnies et insomnies pathologiques du vieillard. *Rev. franç. Géront., 5:* 41-43, Feb. 1959.

26917. Puech, A., J. C. Laurent, and J. Hertault: Le sommeil dans la vieillesse. *Rev. franç. Géront., 5:* 35-37, Feb. 1959.

26918. Puech, A., J. C. Laurent, and J. Hertault: Effet des neuroleptiques sur l'insomnie des vieillards. *Rev. franç. Géront., 5:* 39, Feb. 1959.

26919. Puech, A., A. Pages, and J. L. Lamarque: Le morphogramme des gens âgés. *Rev. franç. Géront., 5:* 7-10, Feb. 1959.

26920. Quaas, M.: Arbeitshygienische Untersuchungen zur Frage der Arbeitsleistung und des Lebensalters bei körperlicher Arbeit. *Dtsch. Gesundhwes., 13:* 979-985, 1958.

26921. Resegotti, E., and I. Prosser: La nostra esperienza in anestesia geriatrica. *Acta anaesth., 9:* 447-461, 1958.

26922. Ries, W., and R. Thierbach: Der Broca-Index als praktisches Mass zur Beurteilung des Körpergewichtes im Laufe des Lebens. *Arch. Hyg., Berl., 142:* 128-143, 1958.

26923. Ruol, A., L. Menozzi, C. Drudi, and B. De Biasio: Ulteriori richerche sul metabolismo idrico nell'età senile. *Gior. Geront., 7:* 68-86, 1959.

26924. Sobel, H.: Lean-body mass creatinine-coefficient deficit and urinary steroids. *Amer. J. clin. Nutrit., 6:* 531-534, 1958.

26925. Spasokukotski, Y. O., and E. K. Gitic: (Indicators of reactivity of the organism in animals of different age groups following blood transfusion.) *Fiziol. Zh. S.S.S.R., 2:* 58-66, 1956. Abstr: *Biol. Sci., 11:* No. 2545, 1958.

26926. Stephen, C. R., and D. C. Grosskreutz: Anaethesie bei geriatrischen Patienten. I. *Ärztl. Wschr., 13:* 517-523, 1958.

26927. Weiss, A. K.: An analysis of the metabolic responses of rats exposed to cold. *Amer. J. Physiol., 196:* 913-916, 1959.

26928. Wirbatz, W.: Die Verwendung des Hydroxydions in der Geriatrie als Vollnarkotikum. I. *Dtsch. Gesundhwes., 13:* 1474-1477, 1958.

26929. Wüllenweber, R.: Alters-Neurochirurgie und moderne Narkose. *Anaesthesist, 7:* 333-337, 1958.

26930. Anonymous: Dietary fat, obesity and longevity. *Nutrit. Rev., 16:* 350, 1958.

26931. Anonymous: Sex and age differences in radiation-induced mutation-rates. *Lancet, 2:* 1218, 1958.

See also Nos. 26603, 26693, 26728, 26776, 26960.

XII. Reproductive System

(ovaries, testis, See Endocrine System)

26932. Boguña, I., J. M. Palleja, and J.-C. Señor: La cirugía ginecológia en la anciana. *Med. clín. Barcelona, 30:* 111-118, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 393, 1959.

26933. Caffaratto, T. M.: Ostetricia storica ed ostetricia fantastica. *Minerva gin., Torino, 10:* 699-702, 1958.

26934. Carvalho, A. V.: La fécondité masculine selon l'âge et la branche d'activité dans la capitale et dans l'intérieur de l'Etat de São Paulo. *Bull. Inst. int. Statist., Rio de J., 35:* 383-399, 1957. Astr: *P. I., 25:* No. 1205, 1959.

26935. Freudenberg, K.: Die Reproduktionsziffer der Bevölkerung Westdeutschlands. *Schmollers Jb., 78:* 83-95, 1958. Abstr: *P. I., 25:* No. 1207, 1959.

26936. Ganser, H. I., and J. R. Wolff: The detection of uterine cancer in women after 60. *Illinois med. J., 114:* 283-285, 1958.

26937. Germany. Federal Republic. Statistisches Bundesamt. (By Karl Schwarz): Die Geborenen nach dem Alter der Mütter und Väter. *Wirtsch. u. Stat., 10:* 338-341, 1958. Abstr: *P. I., 25:* No. 1208, 1959.

26938. Grabill, W. H.: *The fertility of American women.* John Wiley & Sons, New York, 1958, xvi, 448 pp. Abstr: *P. I., 25:* No. 1209, 1959.

26939. Ingram, D. L., A. M. Mandl, and S. Zuckerman: The influence of age on littersize. *J. Endocr., 17:* 280-285, 1958.

26940. Japan. Welfare Ministry. Institute of Population Problems: *(The journal of population problems.)* The Institute, Japan, 1958, No. 72, 88 pp. Abstr: *P. I., 25:* No. 1057, 1959.

26941. Mackinlay, C. J.: A case of chronic inversion of the uterus. *J. Obstet. Gynaec., 65:* 810, 1958.

26942. Ragab, M. T., A. A. Asker, and T. H. Kamal: Effect of age and season of calving on the composition of Egyptian buffalo milk. *Indian J. dairy Sci., 11:* 18-28, 1958. Abstr: *Chem. Abstr., 52:* No. 50532, 1958.

26943. Smith, L. R., and J. H. Pratt: Vaginal hysterectomy in the geriatric patient. *Amer. J. Obstet. Gynec., 13:* 84-91, 1959. Abstr: *Geriatrics, 14:* 76A, 1959.

26944. Trębicka-Kwiatkowska, B.: (Course of labor in elderly primiparae.) *Polsk. Tygod. lek., 13:* 1268-1272, 1958.

26945. Whelpton, P. K.: A "new look" at the post war "babyboom" in the United States. *Bull. Inst. int. Statist., Rio de J., 35:* 463-473, 1957. Abstr: *P. I., 25:* No. 1220, 1959.

See also Nos. 26712, 27081, 27092, 27113, 27144.

XIII. Respiratory System

26946. Auchincloss, J. H., Jr., R. Gilbert, and R. H. Eich: The pulmonary diffusing capacity in congenital and rheumatic heart disease. *Circulation, N. Y., 19:* 232-241, 1959.

26947. Auriol, M., R. Abelanet, and G. Chomette: Trachéobronchopathie chondro - ostéoplastique chez un vieillard. *Arch. Anat. Pathol., 6:* 195-196, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 266, 1959.

26948. Böger, J.: Beeinflussungsmöglichkeiten der Vitalkapazität bei Patienten mit Alterskrankheiten und chronischen Leiden. *Hippokrates, 29:* 666-669, 1958.

26949. Bouroncle Carreón, A.: Edad y tuberculosis. *Rev. Peruana Tuberc., 17:* 293-313, 1957. Abstr: *2:* (Sect. 20), No. 178, 1959.

26950. Bruce, T.: Lungtuberkulos hos gamla. *Sven. Nat. -Fören. Tuberk. Kvart., 53:* 1-6, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 179, 1959.

26951. Butler, J.: The kinetic resistance of the relaxed respiratory system. *Clin. Sci., 16:* 491-505, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 155, 1959.

26952. Cancella, L. de C.: Influence de la tuberculose pulmonaire sur la durée de la vie. *Med. contemp., 76:* 403-408, 1958.

26953. Hiltz, J. E., S. Murray, E. C. McCoy, and T. A. Saul: Looking at the tuberculosis problem. A symposium. *Canad. J. publ. Hlth., 98:* 495-504, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 180, 1959.

26954. Howell, T. H.: The prevention and care of respiratory infections in the elderly. *Practitioner, 181:* 713-718, 1958.

26955. Klaus, E.: Produits soufrés dans le traitement de la bronchite chronique chez les vieillards. *Rev. Méd. Suisse rom., 78:* 660-665, 1958.

26956. Korecký, B.: (Changes of pulmonary elasticity in ontogenesis in rats.) *Československ. Fysiol., 7:* 214-215, 1958.

26957. Le Melletier, J., and T. R. Caulet: La rupture des ganglions tuberculo-anthracosiques dans les bronches à l'âge mûr. *Rev. Tuberc., Paris, 22:* 661-663, 1958.

26958. MacDonald, F. M.: The medical management of bronchiectasis. *Med. Clin. N. Amer., 43:* 209-217, 1959. Abstr: *Geriatrics, 14:* 67A-68A, 1959.

26959. Maeda, M., T. Murohashi, and H. Uchiyama: (Differences due to the age groups in the distribution curves of tuberculin reaction provoked by purified tuberculin, PPD-s). *Kekkaku, 33:* 671-673, 1958.

26960. Posth, H.-E., and N. Tietz: Präoperative Herzkreislauf- und Lungenfunktionsdiagnostik bei Menschen höheren Lebensalters mit der Spiroergographie nach H. W. Knipping. *Z Altersforsch., 13:* 7-22, 1959.

26961. Shibue, A.: (Studies of tuberculin reaction at advanced ages. II. 'Zone phenomenon' of tuberculin reaction in old people.) *Igaku Kenkyu, 28:* 821-827, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 355, 1959.

26962. Tabidze, S. A.: (Treatment of pulmonary tuberculosis in aged patients in the high mountains of Teberda.) *Probl. Tuberk., 36:* (4), 74-79, 1958.

26963. Taylor, R. R., L. N. Rivkin, and J. M. Salyer: The solitary pulmonary nodule. A review of 236 consecutive cases, 1944 to 1956. *Ann. Surg., 147:* 197-202, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 366, 1959.

26964. Vidal, J., and J. J. Guin: Le pronostic actuel de la tuberculose pulmonaire chez les malades âgés de plus de cinquante ans et traités en sanatorium. *Montpellier méd., 53:* 875-878, 1958.

See also No. 26895.

XIV. Sense Organs and Perception

26965. Aczél., G.: Über die Operation nach Kettesy gegen das Altersentropium. *Klin. Mbl. Augenheilk., 132:* 860-864, 1958.

26966. Becker, B.: The decline in aqueous secretion and outflow facility with age. *Amer. J. Ophthal., 46:* 731-736, 1958.

26967. Boles-Carenini, B., and A. Cambiaggi: Are aqueous humor dynamics influenced by aging? II. *Amer. J. Ophthal., 46:* 845-855, 1958.

25968. Braunsteiner, P.: Gerioptil bei der Behandlung der Altersschwerhörigkeit. *Medizinische, Suttgart, —:* (36), 1404-1406, 1958.

26969. Bürger, M., and W. Friedel: Zur Biomorphose des Glaskörpers; Untersuchungen an Glaskörpern junger und alter Rinder. *Z. Altersforsch., 12:* 313-325, 1959.

26970. Burnside, R. M.: Surgery for senile macular degeneration. *Amer. J. Ophthal., 46:* 584-586, 1958.

26971. Diamond, S.: The prevention of refractive visual defects in aging airline pilots. *J. Aviat. Med., 29:* 733-738, 1958.

26972. Hellner, K.: Über chronisch-entzündliche Veränderungen der äusseren Augenmuskeln des Menschen als Zufallsbefund bei Sektionen. *Frankfurt. Z. Path., 68:* 684-692, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 286, 1959.

26973. Hollender, A. R., and O. S. Blum: Hearing loss in persons of advanced age; influence of factors other than the normal aging process. *J. Fla. med. Ass., 45:* 403-406, 1958.

26974. Kadlecová, V., M. Peleška, and A. Vaško: Dependence on age of the diameter of the pupil in the dark. *Nature, Lond., 182:* 1520-1521, 1958.

26975. Leroux-Robert, J., and A. Ennuyer: *Les tumeurs malignes de l'oreille (oreille interne exclue).* Librairie Arnette, Paris, 1957, 335 pp. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 408, 1959.

26976. Marcucci, L.: I recettori gustativi della lingua nella senescenza. Nota preventiva. *Ateneo parmense, 29:* 653-654, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 335, 1959.

26977. Matzker, J., and E. Springborn: Richtungshören und Lebensalter. *Z. Laryng., 37:* 739-745, 1958.

26978. Megighian, D.: Variazioni della soglia olfattiva nell'età senile. *Minerva otorinolar., Torino, 8:* 331-337, 1958.

26979. Müller, H. K.: Ueber das Altern der Linse. *Wien. klin. Wschr., 70:* 935-941, 1958.

26980. Neuberger, F.: Ueber apparative Hörkorrektur im Alter. *Wien. klin. Wschr., 70:* 683-685, 1958.

26981. Neuss, O.: Spontanes Othämotom mit sekundärer Knochenneubildung sowie röntgenologische Ohrmuscheluntersuchungen bei 80 Patienten. *Z. Laryng., 35:* 542, 1956. Abstr: *Z. Altersforsch., 12:* 376, 1959.

26982. Ralph, F. T.: Therapeutic evaluation of citrus bio-flavonoids in some ophthalmic disorders. *Eye, Ear, Nose, Thr. Mon., 37:* 105-110, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 401, 1959.

26983. Sédan, J., G. Farnarier, and G. Ferrand: Contribution à l'étude de la kératesthésie sénile; 920 observations. *Ann. oculist., Paris, 191:* 736-751, 1958.

26984. Šercer, A., and J. Krmpotić: Über die Ursache der progressiven Altersschwerhörigkeit (Presbyacusis). *Acta oto-laryng., Stockh., —:* (Suppl. 143), 5-36, 1958.

26985. Talland, G. A.: The effect of set on accuracy of auditory perception. *Brit. J. Psychol., 49:* 117-130, 1958.

26986. Verney, N.: The expected visual acuity. *Brit. J. Physiol. Optics, 15:* 248-254, 1958.

26987. White, R. P.: Face-hand test responses of psychotic and mentally defective patients. The relation of age to sensory errors in chronic patients. *Arch. Neurol. Psychiat., Chicago 77:* 120-125, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 389, 1959.

XV. Skeletal System

25988. Ashton, E. H., and T. F. Spence: Age changes in the cranial capacity and foramen magnum of hominoids. *Proc. zool. Soc. Lond., 130:* 169-181, 1958.

26989. Baacke, H. H.: Veränderungen am venösen Gefäszsystem bei Osteochondrosis cervicalis. *Fortschr. Röntgenstr., 87:* 721-726, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 175, 1959.

26990. Calandriello, B.: Richerche anatomiche sulle protrusioni posteriori dei dischi intervertebrali dorsali. *Arch. 'Putti' Chir. Org. Movimento, 8:* 116-129, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 176, 1959.

26991. Rotés-Querol, J.: Sobre la hiperostosis anquilosante vertebral senil y un aspecto clinico de la misma. *Med. clin. Barcelona, 30:* 96-99, 1958.

26992. Tschraker, O. A.: Ortopedichna geriatriia. *Khirurgiya, 11:* 635-645, 1958.

See also Nos. 26766, 26781.

XV-A. Skeletal System: *Bone*

26993. Bloise de Napolitano, N.: Osteroporosis. *Rev. Ortop. Traumat. (Latin Amer. Ed.), 2:* 243-250, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 200, 1959.

26994. Bugyi, B.: (Involutional osteoporosis.) *Mag. Tudcom Akad. biol. Orv. Oszt. Közl. 2:* 395-400, 1958.

26995. Dal Monte, A., and L. Negri: Sul trattamento delle fratture pertrocanteriche. *Chir. Org. Movim., 45:* 372-403, 1958.

26996. Demole, M., B. Rilliet, and G. Candardjis: Importance de l'apport protidique dans le traitement de l'ostéoporose sénile. *Lyon. méd., 90:* 645-666, 1958.

26997. Doberauer, W.: Ergebnisse genagelter Schenkelhalsbrüche bei Menschen hohen Alters. *Klin. Med., Wien, 9:* 381-390, 1954. Abstr: *Z. Altersforsch., 12:* 373-374, 1959.

26998. Imrie, J. A., and G. M. Wyburn: Assessment of age, sex and height from immature human bones. *Brit. med. J., —:* 128-131, 1958. Abstr: *Biol. Sci., 11:* No. 3757, 1958.

26999. Jackson, D., and S. M. Weidmann: Fluorine in human bone related to age and the water supply of different regions. *J. Path. Bact., 76:* 451-459, 1958.

27000. Lichtwitz, A., S. De Séze, D. Hioco, and P. Bordier: Tests biologiques practiques d'exploration du squelette. *Ann. Biol. clin., 15:* 598-624, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 163, 1959.

27001. Nik-Khou, —.: (Osteoporosis in senility and in the menopause.) *Rev. fac. Med., 15:* 650-661, 1958.

27002. Reifenstein, E. C., Jr.: Steroid hormones and the aging skeleton. *In:* H. Nowakowski (Editor), *Hormone und Psyche. Die Endokrinologie des alternden Menschen.* Springer-Verlag, Berlin, 1958, pp. 161-206.

27003. Schiffer, D., and A. Fabiani: Rilievi istologici sulle ependimopatie nei senili. *Boll. Soc. ital. Biol. sper., 34:* 1253-1256, 1958.

27004. Schwarzweller, F.: Über die Häufigkeit der Osteoporose bei Rückenschmerzen. *Münch. med. Wschr., 99:* 1589-1592, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 202, 1959.

27005. Selye, H.: Skeletal lesions produced by chronic treatment with somatotrophic hormone (STH) and aminoacetonitrile (AAN). *J. Geront., 12:* 270-278, 1957.

27006. Soutter, F. E.: Management of elderly patients with fractures of the upper end of the femur. *Geriatrics, 14:* 153-162, 1959.

27007. Stein, I., and M. L. Beller: Management of osteoporosis in the elderly patient. Part II. *Geriatrics, 14:* 175-181, 1959.

27008. Taylor, A. N., and P. J. Fagan: Replacement with prosthetic femoral head as a salvage procedure. *Sth. med. J., Birmingham, 51:* 1385-1389, 1958.

27009. Tzamalukas, G., and H. Queisser: Zum Problem der Spontanfrakturen und ihrer Therapie am dystrophisch veränderten Altersknochen mit besonderer Berücksichtigung der Ostitis deformans Paget. *Chirurg, 29:* 490-494, 1958.

27010. Vignon, G., and J. Maitrepierre: Grande ostéomalacie compliquée d'ostéoporose discrète. *Rev. Lyonn. Méd., 7:* 483-491, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 203, 1959.

27011. Vignon, G., A. Tissot, and J. Pasquier: L'ostéoporose sénile. étude étiologique, clinique, radiologique et anatomique. *Rev. lyonn. Méd., 7:* 459-468, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 201, 1959.

27012. Vignon, G., J. Pasquier, and A. Tissot: Contribution à l'étude biologique de l'ostéoporose sénile. *Rev. lyonn. Méd., 7:* 469-475, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 343, 1959.

27013. Vignon, G., J. Pasquier, and A. Tissot: Diagnostique de l'ostéoporose sénile et pré-sénile. *Rev. lyonn. Méd., 7:* 493-500, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 372, 1959.

See also Nos. 26690, 26695.

XV-E. Skeletal System: *Arthritis and Rheumatism**

27014. Yount, E.: Arthritis in the aged. *N. C. med. J., 19:* 342-345, 1958.

XVI. Skin and Integument

27015. Chesrow, E. J., S. V. Zajdzinski, H. B. Fox, J. T. Brerue, and J. Musci: *The use of sorbefacin ointment in the treatment of decubiti, leg and tropical ulcers.* The Author, Oak Forest Hosp., Oak Forest, Ill., 1958, 11 pp.

27016. Ellis, R. A., W. Montagna, and H. Fanger: Histology and cytochemistry of human skin. XIV. The blood supply of the cutaneous glands. *J. investig. Dermat., 30:* 137-145, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 289, 1959.

27017. Nuytten, J.: Peau du vieillard et cancer. *Cancérologie,* 3: 91-94, 1957.

27018. Reintjes, M.: Untersuchungen über die Silberung des Hauskaninchens. *Biol. Zbl., 76:* 414-428, 1957.

* Selected references.

27019. Silvestri, U.: Osservazioni istologiche su la ghiandola sebacea del vecchio. *Gior. Geront.*, 7: 113-119, 1959.

27020. Yokota, H.: (Histochemical and electronmicroscopical studies on elastic fibers. IV. Histochemical observations of human senile skins after elastase, testicular hyaluronidase, α-amylase, collagenase, pectinase and trypsin treatment.) *Kumamoto med. J., 10:* 208-224, 1957.

27021. Young, A. W., Jr.: The dermatogeriatric service in a resident hospital. *N. Y. St. J. Med., 58:* 3451-3454, 1958.

See also Nos. 26593, 26681.

XVII. Urogenital System
(includes prostate)

27022. DeGironcoli, F.: Die Prostatahypertrophie als Alternsfaktor. *Dtsch. med. J., 9:* 127-128, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 263, 1959.

27023. Herbeuval, R., G. Guillemin, G. Cuny, A. Larcan, and M. Bessot: Essai de traitement du cancer prostatique et de ses métastases par le chlorotrianisène (T.A.C.E.). *Rev. franç. Géront., 4:* 158-160, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 410, 1959.

27024. Scott, W. W. (Moderator), R. S. Hotchkiss, P. B. Hudson, J. K. Lattimer, and W. F. Whitmore, Jr. (Panelists): Panel discussion on the clinical management of prostatic disease. *J. Amer. geriat. Soc., 7:* 295-313, 1959.

27025. Wallace, D. M.: The medical care of prostatism. *Med. Pr., 240:* 690-693, 1958.

GERIATRICS

I. General Orientation

27026. Greco, N. V., and A. A. Fernández: La medicina contemporánea vista en sus tendencias; medicina geriátrica. *Sem. méd., B. Aires, 113:* 120-124, 1958.

27027. Kountz, W. B.: Current concepts in geriatrics. *Industr. Med. & Surg., 27:* 537-539, 1958.

27028. Rittelmeyer, L. F., Jr.: Medicine's challenge; an aging population. *Miss. Doctor, 36:* 96-99, 1958.

II. and III. Medical Care and Diagnosis
(medical rehabilitation)

27029. Akester, J.: The health visitor's contribution to the care of the aged. *J. roy. Soc. Hlth., London, 78:* 834-837, 1958.

27030. Alvarez, W. C.: Diagnostic problems in the elderly. *Geriatrics, 14:* 266, 1959.

27031. Amberg, R.: The AHA position on hospital needs of the aged. *Amer. J. Nurs., 58:* 1568-1569, 1958.

27032. Baltimore (Md.). Keswick Home: *75 years of concern for the chronically ill.* The Home, Baltimore, 1959, 32 pp.

27033. Bergogne, C.: Thérapeutique embryonnaire en gériatrie. *Gaz. méd. Fr., 65:* 993, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 212, 1959.

27034. Chowhan, J. S.: Therapeutics in old age. *Med. Dig., Bombay, 26:* 213-226, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 374, 1959.

27035. Gimble, A. I., and R. A. Robinson: *Report of the geriatrics rehabilitation program; for the twelve-month period March 1, 1957 through February 28, 1958.* The Author, Michael Reese Hosp., Chicago, Jan. 1959, 32 pp. (Mimeogr.).

27036. Harrington, A.: A case study of Sparks Manor; designed for elderly residents. *Hospitals, Chicago, 32:* (24), 34-37, 1958.

27037. Illinois. Department of Public Health: *Minimum standards, rules and regulations for homes for the aged.* The Department, Springfield, July 1958, 44 pp.

27038. Joris, T.: Quelques problèmes posés par l'hôpitalisation des personnes âgées. *Techn. hosp., Paris, 13:* 53-58, 1958.

27039. Kay, G. D., and G. F. Pennal: Rehabilitation of the elderly amputee. *Canad. J. Surg., 2:* 44-51, 1958.

27040. Kostick, A., and T. Rosen: Extension service in a home for the aged. *Geriatrics, 14:* 247-251, 1959.

27041. Matell, R.: *Problems of nursing home care; an interpretive summary of the Third Annual Wisconsin Institute on Nursing Home Care.* Extension Div., Univ. Wisc., Madison, 1957, 42 pp.

27042. Nacke, O.: Ist der Schluss von der Häufigkeit der Todesursachen-Bezeichnung Altersschwäche auf die Qualität der Diagnostik zulässig oder nicht? *Münch. med. Wschr., 100:* 1446-1447, 1958.

27043. (The) Netherlands. Rotterdam Bouwcentrum: *Housing for old people; nursing homes.* Documentatie Bouwezen, Rotterdam, 1955, 83 pp.

27044. New York City. Community Council of Greater New York: *How to select a nursing home.* The Council, New York, Dec. 1958, 7 pp.

27045. New York. Health Information Foundation: Use of health services by the aged. *Progr. hlth. Serv., 8:* (4), 1-6, 1959.

27046. New York Medical College. Metropolitan Medical Center: *Course in principles and practice of geriatric rehabilitation for home, hospital and nursing home at Bird S. Coler Hospital April 21 through May 2, 1958.* The Center, New York, 1958.

27047. Parenti, G. C., and M. Fabi: Concetti ed orientamenti in tema di riabilitazione del vecchio con particolare riguardo all'ultrasettantenne operato. *Minerva med., Torino, 49:* 3613-3629, 1958.

27048. Pasqualicchio, A.: Una nuova associazione di farmaci (prednisolone, metilandrostendiolo, inositfosfato di ca e mg) nella cura del marasma senile. *Gior. Geront., 7:* 133-137, 1959.

27049. Portias, L. H.: Un traitement nouveau de certains troubles de la sénescence. *Sem. méd. profess., Paris, 34:* 1255-1258, 1958.

27050. Reese, D. E.: *How to be a nursing aid in a nursing home.* Amer. Nurs. Home Assoc., Washington, 1958. Abstr: *Maturity, 5:* (4), 25, 1958.

27051. Rèpaci, M.: Il 2° convegno sulla riabilitazione nell'anziano. *Longevità, 6:* 103, 1958.

27052. Roanoke (Va.). Conference on Organized Home Care: *Report on conference; June 9-13, 1958.* The Conference, Roanoke, 1958, 21 pp.

27053. Robinson, K. V., and F. A. Walkey: Hospital care of the aged. *Publ. Hlth., Lond., 73:* 130-135, 1959.

27054. St. Louis (Mo.). Jewish Orthodox Old Folks Home: *Manual for the nursing department.* The Home, St. Louis, Jan. 1958, 40 pp.

27055. Scardigli, G.: La terapia termale nella riabilitazione dell'anziano. *Minerva med., Torino, 49:* 3629-3634, 1958.

27056. Scherwin, J.: (The need for hospital bed space for sick aged at the Aarhus community.) *Ugesk. Laeg., 120:* 1162-1174, 1958.

27057. Sloan, R. P.: Community hospital adds a long-term unit. *Mod. Hosp., 90:* 55-58, Feb. 1958.

27058. Snoke, A. W.: Recommendations of the American Hospital Association. *Trustee, 11:* 12-17, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 424, 1959.

27059. Sommer, R.: Cooking skills of geriatric patients. *J. Amer. geriat. Soc., 7:* 343-348, 1959.

27060. Taylor, P. H., D. K. Heydinger, and L. C. Roettig: The management of trauma in the aged. *Amer. J. Surg., 97:* 63-68, 1959. Abstr: *Geriatrics, 14:* 74A, 76A, 1959.

27061. U. S. Department of Health, Education and Welfare. Public Health Service. Bureau of State Services. Division of Special Health Services. Chronic Disease Program: *National conference on nursing homes and homes for the aged.* U. S. Govt. Print. Office, Washington, 1958, 85 pp.

27062. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Hospital and Medical Facilities: *Directory of state agencies having primary legal responsibility for standards of maintenance and operation of hospitals, nursing homes, homes for the aged and other similar facilities except those operated by federal and state governments.* The Division, Washington, Nov. 1, 1956.

27063. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Hospital and Medical Facilities. Program Evaluation and Reports Branch: *Costs of operating nursing homes and related facilities; an annotated bibliography. (Preliminary draft.)* The Branch, Washington, Jan. 1959, 18 pp.

27064. Wright, W. A.: Nursing home care. *J. Lancet, 78:* 499-500, 1958.

27065. Zanoli, R.: Prospettive e limiti della riabilitazione nel malato ortopedico anziano. *Minerva med., Torino, 49:* 3609-3612, 1958.

27066. Anonymous: Profilaxis y tratamiento del envejecimiento por el metodo Aslan. *Galicia clin., 30:* 508-511, 1958.

27067. Anonymous: These long-term care units meet a growing community need . . . in Alabama . . . in California. *J. Amer. hosp. Ass., 32:* 32-34, July 1958.

See also Nos. 27115, 27131.

IV. Disease
(chronic, infectious, and mental)

27068. Albanese, B.: Il liquor nei dementi senili. *Rass. Studi psichiat., 47:* 500-507, 1958.

27069. Barry, H., Jr.: Critical ages for maternal bereavement in psychoneuroses. (Abstr.). *Arch. Neurol. Psychiat., Chicago, 76:* 617, 1956.

27070. Beckenstein, N., and L. S. Palmer: Use of reserpine (rau-sed) in the treatment of the senile and cerebral arteriosclerotic psychotic. *Psychiat. Quart., 32:* 266-272, 1958.

27071. Blitzman, L., E. J. Rogers, and A. P. Kent: A medical geriatric evaluation at a municipal housing project. *J. Amer. geriat. Soc., 7:* 360-367, 1959.

27072. Bronisch, F. W.: Psychopathologie des höheren Lebensalters. *Schweiz. Arch. Neurol. Psychiat., 81:* 105-123, 1958.

27073. Brushlinskaia, L. A., and M. M. Mazur: (Use of the All-Union census of population for study of morbidity.) *Sovetsk. zdravookhr., 17:* 29-34, 1958.

27074. Callieri, B., and R. Priori: Contributo clinico e psicopatologico al problema del delirio insorgente nell'età senile. *Arch. Psicol. Neurol. Psychiat., 19:* 365-385, 1958.

27075. Carver, M. J., J. P. Dailey, R. L. Colescott, and J. A. Smith: Effect of a cholesterol lowering agent on the aged mentally ill. *Dis. nerv. Syst., 19:* 511-512, 1958.

27076. Cavalieri, U.: Aspetti medico-sociali dell'anziano debole mentale. *Longevità, 6:* (Suppl.), 3 pp., 1958.

27077. Cavalieri, U.: La figura dell'anziano debole mentale. *Longevità, 6:* (Suppl.), 4 pp., 1958.

27078. Cavalieri, U.: La terapia dei disturbi mentali. *Longevità, 6:* (Suppl.), 3 pp., 1958.

27079. Cavalieri, U.: L'anziano debole mentale. *Minerva med., Torino, 49:* 3653-3664, 1958.

27080. Davis, D., J. M. A. Weiss, E. F. Gildea, and I. N. Mensh: Psychiatric problems of later life. II. Clinical syndromes. *Amer. Practit. dig. Treat., 10:* 61-65, 1959.

27081. De Laurentiis, G.: L'isterectomia vaginale nel trattamento chirurgico della tubercolosi genitale in età senile. *Riv. Ostet., Firenze, 13:* 328-340, 1958.

27082. Enterline, P. E., and K. G. Capt: A validation of information provided by household respondents in health surveys. *Amer. J. publ. Hlth., 49:* 205-212, 1959.

27083. Geill, T.: (Psychology and psychoses of old age.) *Mskr. prakt. laegegern., 36:* 280-293, 1958.

27084. Goldfarb, A. I.: Depression, brain damage, and chronic illness of the aged; psychiatric diagnosis and treatment. *J. chronic Dis., 9:* 220-233, 1959.

27085. Goloveshko, S. M.: (Certain features of the course of Botkin's disease in the aged.) *Sovetsk. Med., 22:* (8), 27-31, 1958.

27086. Gruen, A.: Old age as a factor in motivation for therapy. *Int. J. soc. Psychiat., 3:* 61-66, 1957. Abstr: *P. A., 33:* No. 1410, 1959.

27087. Halpert, B., R. P. Foster, and M. J. Musser: Multiple malignant neoplasms in a man aged 89 years; a clinicopathologic conference. *Geriatrics, 14:* 194-200, 1959.

27088. Heumann, C.: Interne Therapie der Aufbrauchskrankheiten. *Med. Mschr., 12:* 614-616, 1958.

27089. Hoff, H., and K. Pateisky: Die Dekompensation bei den Alterspsychosen und ihre Behandlung mit Diamox. *Wien. klin. Wschr., 70:* 571-575, 1958.

27090. Jelgersma, H. C.: Die frühzeitige Dementia senilis bei Mongoloiden; eine klinische Studie. *Folia. psychiat, & c. neerl., 61:* 367-374, 1958.

27091. Kaplan, J.: Posthospital social planning for geriatric mental patients. *Geriatrics, 14:* 185-189, 1959.

27092. Kolodziejska, H.: (Relationships between clinical stage, duration of symptoms, age and menopause in patients with mammary cancer.) *Nowotwory, 8:* 17-23, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 297, 1959.

27093. Lieser, H.: Therapeutische Probleme bei den endogenen Psychosen des höheren Lebensalters. *Med. Mschr., 12:* 657-661, 1958.

27094. MacMahon, B.: I. Breast cancer at menopausal ages; observed incidence changes. II. Epidemiological evidence on nature of Hodgkin's disease. *Cancer, 10:* 1037-1054, 1957. Abstr: *Biol. Sci., 11:* No. 2796, 1958.

27095. Mancini, E., A. Battisti, and F. Foschi: Paralisi progressiva senile; contributo anatomo-clinico. *G. Psichiat. Neuropatol., 86:* 721-740, 1958.

27096. Milmore, B. K.: Influence of changes in general mortality rates, and of age upon survival of patients with a chronic disease. *Cancer, 11:* 1255-1263, 1958.

27097. Miyaji, T.: The incidence of malignant tumors in autopsy cases of Japan during the ten years from 1946 to 1955 inclusive. *Gann, Tokyo, 48:* 523-524, 1957. Abstr: *P. I., 25:* No. 1187, 1959.

27093. Moody, L. E.: Release program for geriatric patients at a state mental hospital. *Geriatrics, 14:* 182-184, 1959.

27099. Nestor Gómez, R., and J. Schwarzman: Tratamiento de la infección focal en geriatría. *Sem. méd., B. Aires, 113:* 378-380, 1958.

27100. Nicoletti, I., and G. Magherini: Studio sulla morbosità psichiatrica ospedaliera delle diverse regioni antropo-geografiche della provincia di Firenze, con particolare riferimento alla struttura, per età e per sesso, delle singole popolazioni. *Rass. Studi psichiat., 47:* 475-499, 1958.

27101. Niedermeyer, E.: Über Epilepsie im höheren Lebensalter. *Arch. Psychiat. Nervenkr., 197:* 248- 262, 1958.

27102. Parker, S.: A note on first admissions of the aged to mental institutions. *J. nerv. ment. Dis., 127:* 275-278, 1958.

27103. Pennington, V. M.: Benzilic acid diethylaminoethylester hydrochloride (Phobex) in the treatment of chronically psychotic patients. *J. Amer. geriat. Soc., 7:* 79-80, 1959.

27104. Phipps, E. B., and F. D. Hogle: Pharmacologic treatment of geriatric mental patients; clinical effects of the combined administration of nicotinamide and metrazol to a group of ten geriatric state hospital patients. *J. Indiana med. Ass., 51:* 1661-1663, 1958.

27105. Pichler, E.: Zur psychiatrischen Pharmakotherapie in der Geriatrie. *Wien. klin. Wschr., 70:* 921-924, 1958.

27106. Post, F.: Mental disorders in old age; differential diagnosis and management. *Med. Pr., 238:* 177-180, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 233, 1959.

27107. Rudd, T. N.: Preventing senile dementia; the need for a new approach. *J. Amer. geriat. Soc., 7:* 322-326, 1959.

27108. Schiller, G.: Alterszusammensetzung, Ursachen und Grad der Körperbehinderung bei den Leipziger Beschädigten nach dem Stand 31. 12. 1957. *Z. Altersforsch., 13:* 32-41, 1959.

27109. Schwarzbauer, F.: Die Krebshäufigkeit in der Bundesrepublik 1952/53 im Vergleich zu Dänemark, Frankreich und den USA. *Strahlentherapie, 105:* 357-385, 1958. Abstr: *P. I., 25:* No. 1196, 1959.

27110. Settel, E.: Buclizine, a new tranquilizing agent. *J. Amer. geriat. Soc., 7:* 67-70, 1959.

27111. Sheps, J.: Paranoid mechanisms in the aged. *Psychiat., Wash., 21:* 399-404, 1958.

27112. Smigel, J. O., K. J. Lowe, and M. Green: Emotional and psychic problems of institutionalized geriatric patients; evaluation of hydroxyzine. *J. Amer. geriat. Soc., 7:* 61-65, 1959.

27113. Stern, E.: Cytological screening for cervical cancer. Comparative findings in a 6-year survey of a well population. *Cancer Res., 11:* 122-126, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 264, 1959.

27114. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Acute conditions: incidence and associated disability; United States, July 1957-June 1958.* The Division, Washington, Dec. 1958, Series B-6, 47 pp.

27115. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Hospitalization: patients discharged from short-stay hospitals; United States, July 1957-June 1958.* The Division, Washington, Dec. 1958, Series B-7, 40 pp.

27116. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Persons injured by class of accident; United States, July 1957-June 1958.* The Division, Washington, Feb. 1959, Series B-8, 62 pp.

27117. Vallecorsi, G., and G. Bianucci: Primi rilievi statistici sul censimento della popolazione di età senile del comune di firenze. *Gior. Geront., 7:* 87-91, 1959.

27118. Warren, M.: Mental confusion in elderly persons. *Geriatrics, 14:* 207-218, 1959.

27119. Weiss, J. M., E. F. Gildea, D. Davis, and I. N. Mensh: Psychiatric problems of later life. I. Nature and scope. *Amer. Practit. dig. Treat., 9:* 1955-1959, 1958.

27120. Wilner, D. M., R. P. Walkley, M. N. Glasser, and M. Tayback: The effects of housing quality on morbidity; preliminary findings of the Johns Hopkins longitudinal study. *Amer. J. publ. Hlth., 48:* 1607-1615, 1958.

27121. Winston, E.: Reducing the number of patients in mental hospitals by providing non-institutional care for the aging. *Ment. Hyg., N. Y., 42:* 544-549, 1958.

27122. Woodall, J., K. E. Rowson, and J. C. McDonald: Age and Asian influenza, 1957. *Brit. med. J., —:* (5108), 1316-1318, 1958.

27123. Zykova, Z. I.: (Clinical aspects of catatonic forms of schizophrenia in the aged.) *Zh. Nevropat., 58:* 713-721, 1958.

27124. Anonymous: Chicago central service for chronically ill. *Chron. Ill. News Lett., 10:* 2-5, Feb. 1959.

27125. Anonymous: Multidisciplinary studies of illness in aged persons. II. A new classification of functional status in activities of daily living. *J. chronic Dis., 9:* 55-62, 1959.

See also Nos. 26748, 26839, 26852, 26870, 26874, 26875, 26936, 26975, 27017, 27023, 27129, 27344.

V. Hygiene

27126. Baumetz, H.: (Mental hygiene in geriatrics.) *Dapim Refuiim, 16:* 5-6, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 309, 1959.

27127. Goldfarb, A. I.: Minor maladjustments in the aged. Chap. 20, *in:* S. Arieti (Editor), *American Handbook of Psychiatry.* Basic Books, Inc., New York, 1959, Vol. 1.

27128. Gutkin, A. I.: (Child hygiene as basis for the prevention of senescence.) *Trud. Leningradsk. sanit. gig. med. Inst., 44:* 246-265, 1958.

27129. Lenzner, A. S.: Practice and perspectives in geriatric psychiatry. *J. Hillside Hosp., 7:* 190-201, 1958.

27130. Lomonaco, T.: Alcune controindicazioni del viaggio in aero per persone anziane. *Riv. Geront. Geriat., 8:* 1-8, 1959.

27131. Mensh, I. N., J. M. A. Weiss, D. Davis, and E. F. Gildea: Psychiatric problems of later life. III. Treatment and rehabilitation. *Amer. Practit. dig. Treat., 10:* 225-228, 1959.

27132. Nichols, C. R., and E. W. Busse: Some aspects of mental health and illness in the aged. *N. C. med. J., 19:* 352-354, 1958.

27133. Roth, M.: Some problems of mental health in old age. *J. roy. Soc. Hlth., London, 78:* 813-822, 1958.

27134. Roth. M.: Mental health in old age. *Med. World, Lond., 89:* 417-424, 1958.

See also No. 26906.

VII. Surgery

27135. Amdrup, E., E. Halkier, K. H. Køster, P. Sønder, and F. Zachariae: (Surgery in the senium; a survey of elderly patients in a surgical department, 1946-1955.) *Danish med. Bull., 5:* 249-260, 1958.

27136. Angrisani, G.: In tema di chirurgia geriatrica d'urgenza; osservazioni su 592 casi. *G. ital. Chir., 14:* 1037-1048, 1958.

27137. Becker, T.: Biomorphose und Geschlecht als chirurgisches Problem. *Z. Altersforsch., 12:* 355-363, 1959.

27138. Camp, E. H.: Some aspects of surgery in the aged. *N. C. med. J., 19:* 346-348, 1958.

27139. Dettre, G., and J. Ladanyi: (Data on geriatric surgery based on 5 years material of the clinic.) *Mag. Sebészet, 11:* 57-65, 1958.

27140. Dvoskin, S.: Medical considerations in cancer surgery of the aged. (Abstr.). *J. Iowa St. med. Soc., 48:* 587-592, 1958.

27141. Heinzmann, F.: Zur Nachbehandlung sehr alter Menschen nach Magen- und Darmresektionen. *Wien. med. Wschr., 108:* 915-916, 1958.

27142. Kern, E., and J. Hartung: Le risque opératoire chez le vieillard agé de plus de 75 ans. *Anésthesie, Paris, 15:* 300-305, 1958.

27143. Niesert, W., and G. Seidenschnur: Operationen an alten Frauen. *Z. Geburtsh. Gynäk., 150:* 249-263, 1958.

27144. Prochorow, M.: (Personal surgical technic for uterine prolapse in elderly women.) *Gin. polska, 29:* 433-446, 1958.

27145. Tobik, S., and G. Plewinski: (Surgery of peptic ulcers in patients past 60.) *Polsk. Tygod. lek., 13:* 1033-1037, 1958.

See also Nos. 26736, 26902, 26965, 26970, 27047, 27060.

PSYCHOLOGICAL PROCESSES

27146. Billig, O., and R. W. Adams, Jr.: Emotional conflicts of the middle-aged man. *Geriatrics, 12:* 535-541, 1957. Abstr: *P. A., 33:* No. 923, 1959.

27147. Birren, J. W.: Aging of organs; aging and the nervous system. *In: VA Prospectus; Research in Aging.* U. S. Govt. Print. Office, Washington, 1959, pp. 63-81.

27148. Botwinick, J., J. F. Brinley, and J. E. Birren: Set in relation to age. *J. Geront., 12:* 300-305, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 222, 1959.

27149. Botwinick, J., E. A. Jerome, J. E. Birren, and J. F. Brinley: Light aversion motivation in psychologic studies of aging in rats. *J. Geront., 12:* 296-299, 1957.

27150. Brinley, J. F., and J. Botwinick: Preparation time and choice in relation to age differences in response speed. *J. Geront., 14:* 226-228, 1959.

27151. Brown, C. C.: Changes in avoidance conditioning following psychotherapeutic treatment. *J. nerv. ment. Dis., 125:* 487-489, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 390, 1959.

27152. Clausen, J., and R. Karrer: Phosphene threshold as related to age and sex. *J. Psychol., 47:* 189-198, 1959.

27153. Comalli, P. E., Jr., S. Wapner, and H. Werner: Perception of verticality in middle and old age. *J. Psychol., 47:* 259-266, 1959.

27154. Crawford, P. L.: The statistical significance of difference in performance on the Leiter Adult Intelligence Scale, the Wechsler Adult Intelligence Scale and the Porteus Maze by a heterogeneous mental hospital population. *Psychol. serv. Center J., 11:* 89-92, 1959.

27155. Diller, L., and M. Riklan: Rorschach correlates in Parkinson's disease; M, motor inhibition, perceived cause of illness, and self-attitudes. *Psychosom. Med., 19:* 120-126, 1957. Abstr: *P. A., 32:* No. 3235, 1958.

27156. Eisdorfer, C., E. W. Busse, and L. D. Cohen: The WAIS performance of an aged sample; the relationship between verbal and performance IQs. *J. Geront., 14:* 197-201, 1959.

27157. Fraisse, P., and F. Orsini: étude expérimentale des conduites temporelles. III. étude génétique de l'estimation de la durée. *Année psychol., 58:* 1-6, 1958.

27158. Fraser, D. C.: Decay of immediate memory with age. *Nature, Lond., 182:* 1163, 1958.

27159. Greenblatt, R. B., and Scarpa-Smith, C. J.: Nymphomania in postmenopausal women. *J. Amer. geriat. Soc., 7:* 339-342, 1959.

27160. Hoeck-Gradenwitz, E.: Maturity and life-stages. *Acta psychiat. neur. scand., 33:* 452-470, 1958.

27161. Jacobs, H. L.: Spiritual resources for the aged in facing the problem of death. *Bull. inst. Geront. (State Univ. Iowa), 6:* (Suppl. 3), 3-8, March 1959.

27162. Kral, V. A.: Senescent memory decline and senile amnestic syndrome. *Amer. J. Psychiat., 115:* 361-362, 1958.

27163. Krugman, A. D.: A note on level-of-aspiration behavior and aging. *J. Geront., 14:* 222-225, 1959.

27164. Lawshe, C. H., and R. E. Schucker: The relative efficiency of four test weighting methods in multiple prediction. *Educ. psychol. Measur., 19:* 103-114, 1959.

27165. Meerloo, J. A. M.: Some psychologic problems of the aged patient. *N. Y. med. J., 58:* 3810-3814, 1958. Abstr: *Geriatrics, 14:* 64A, 1959.

27166. Olsen, H.: (Psychic problems in old age.) *Mskr. prakt. laegegern., 36:* 373-380, 1958.

27167. Patterson, C. H.: Attitudes toward work. *Publ. Aid Ill., 26:* (3), 1-3; 10, 1959.

27168. Stolze, H.: Reifungsstufen und Reifungskrisen im Leben der Frau. *Z. Psychother. med. Psychol., 7:* 138-150, 1957. Abstr: *P. A., 33:* No. 936, 1959.

27169. Talland, G. A.: Age and the effect of anticipatory set on accuracy of perception. *J. Geront., 14:* 202-207, 1959.

27170. U. S. National Institute of Mental Health. (Compiled by Dr. James E. Birren): *Bibliography on psychological aspects of aging; January 1955-July 1958.* The Institute, Bethesda, 1958, 13 pp.

27171. Vince, M. A.: "String-pulling" in birds. II. Differences related to age in greenfinches, chaffinches and canaries. *J. Anim. Behav., 6:* 53-59, 1958. Abstr: *Biol. Sci., 11:* No. 5753, 1958.

27172. Weinberg, J.: Aging of groups. *In: VA Prospectus; Research in Aging.* U. S. Govt. Print. Office, Washington, 1959, pp. 107-121.

See also Nos. 26580, 26915, 26985, 27083, 27215, 27218.

SOCIAL & ECONOMIC ASPECTS

I. Accidents

27173. Fleetwood, J. F.: A survey of accidents in old age. *J. Irish med. Ass., 43:* 292-293, 1958.

27174. Metrop. Life Insur. Co.: Fatal accidents among men at working ages. *Statist. Bull. Metrop. Life Insur. Co., 40:* 8-10, Jan. 1959.

27175. Parrish, H. M. and T. P. Weil: Patient accidents occurring in hospitals; epidemiologic study of 614 accidents. *N. Y. St. J. Med., 58:* 838-846, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 303, 1959.

See also No. 26898.

III. Demography

27176. Agarwala, S. N.: A method for estimating decade internal migration in cities from Indian census data. *Indian econ. Rev., 4:* 59-76, 1958. Abstr: *P. I., 25:* No. 1425, 1959.

27177. Aromin, B. B.: The demographic situation in the Philippines. *Statist. Reporter, Manila, 2:* (3), 1-6, 1958. Abstr: *P. I., 25:* No. 1048, 1959.

27178. Biraben, J.: (Essay on the demographic development of the U.S.S.R.). *Population, 13:* (2), 29-62, 1958. Abstr: *P. I., 25:* No. 1049, 1959.

27179. Bird, R.: *Resources and levels of income of farm and rural nonfarm households in eastern Ozarks, Missouri.* Agric. Exper. Sta., Univ. Missouri, Columbia, 1958, Res. Bull. 661, 71 pp. Abstr: *P. I., 25:* No. 1050, 1959.

27180. Canada. (Alberta). Industries and Labor Department. Statistics Bureau: *Graphs of growth.* Industr. Devel. Br., Econ. Affairs Dept., Edmonton, 1957, 32 pp. Abstr: *P. I., 25:* No. 1110, 1959.

27181. Carr-Saunders, A.M.: *A survey of social conditions in England and Wales as illustrated by statistics.* Clarendon Press, Oxford, 1958, xxii, 302 pp. Abstr: *P. I., 25:* No. 1003, 1959.

27182. Chandra Sarker, S.: Population planning in China. *Population Rev., 2:* 49-58, 1958. Abstr: *P. I., 25:* No. 1051, 1959.

27183. Chasteland, J.: Un siècle et demi de dénatalité et dix ans d'excédent. *Esprit, Paris, 25:* 701-715, 1957. Abstr: *P. I. 25:* No. 1206, 1959.

27184. Chellaswami, T.: Population trends and labour force in India; 1951-66. *Population Rev., 2:* 42-48, 1958. Abstr: *P. I. 25:* No. 1351, 1959.

27185. East African High Commission. Statistical Department: *Tanganyika. African census 1957. Analysis by sex and age for province, district and territorial census areas.* The Commission, Tanganyika, March 1958, 21 pp.

27186. East African High Commission. Statistical Department: *Tanganyika. Population census 1957. Analysis of total population. Certain analyses by race and sex, geographical area, age, religion and nationality.* The Commission, Tanganyika, March 1958, 10 pp.

27187. Febvay, M.: Evolution naturelle de la population française jusqu'en 1975. *Population, 13:* 487-489, 1958. Abstr: *P. I. 25:* No. 1130, 1959.

27188. France. Institut National de la Statistique et des Etudes Economiques. (By L. Cahen): Evolution démographique. *étud. Conjonct., 13:* 136-141, 1958. Abstr: *P. I., 25:* No. 1112, 1959.

27189. Freedman, R. F., P. K. Whelpton, and A. A. Campbell: Family planning in the U. S. *Sci. Amer., 200:* (4), 50-55, 1958.

27190. Illinois. State Department of Public Health. Bureau of Statistics: *Population for Illinois, Chicago, and downstate by age and color; estimated, 1956 and enumerated, 1950.* The Bureau, Springfield, 1958, 7 pp.

27191. Japan. Welfare Ministry. Institute of Population Problems: *(Annual reports of the Institute of Population Problems, No. 3, 1958.)* The Institute, Tokyo, 1958, 86 pp. Abstr: *P. I., 25:* No. 1056, 1959.

27192. Lento, R.: (The problem of the great age classes.) *Econ. Rev., Helsinki,* —: (2), 63-71, 1958. Abstr: *P. I., 25:* No. 1366, 1959.

27193. Luxembourg. Office de la Statistique Generale: La population du Grand-Duché au 31 décembre 1957. *Bull gén. Statist., 9:* 94, 1958. Abstr: *P. I., 25:* No. 1121, 1959.

27194. Mayer, K. B., and S. Goldstein: *Migration and economic development in Rhode Island.* Brown Univ. Press, Providence, 1958, viii, 64 pp. Abstr: *P. I., 25:* No. 1346, 1959.

27195. Montello, J.: Distribution par âge de groupes speciaux de la population. *Bull. Inst. int. Statist., Rio de J., 35:* 457-461, 1957. Abstr: *P. I., 25:* No. 1436, 1959.

27196. Mortara, G.: Aspectos ecônomicos da composição por idade da população do Brasil. *Rev. brasil. Estatist., 18:* 81-85, 1957. Abstr: *P. I., 25:* No. 1334, 1959.

27197. (The) Netherlands. Centraal Bureau voor de Statistiek: (Special data; vital statistics, migration and age distribution, 1957.) *Maand. Bevolk., 6:* 103-132, 1958. Abstr: *P. I., 25:* No. 1515, 1959.

27198. Okasaki, A.: Population problems of Japan. *Far East. econ. Rev., 25:* 298-304, 1958. Abstr: *P. I., 25:* No. 1062, 1959.

27199. Peru. Ministerio de Salud Pública y Asistencia Social. Servicio Cooperativo Interamericano de Salud Pública: *Censo experimental de población y vivienda, Trujillo, Perú, 1956.* Inf. Bioestadísticos Esp. No. 1, Lima, June 1958, XII, 47 pp. Abstr: *P. I., 25:* No. 1506, 1959.

27200. Retegan, G.: (The pyramid of age as a procedure for demographic analysis.) *Rev. Statist., Bucharest, 7:* 36-45, 1958.

27201. Sudan. Ministry for Social Affairs. Population Census Office. (By Karol Krótki): *First population Census of Sudan 1955/56. 21 facts about the Sudanese.* The Office, Khartoum, 1958, 80 pp. Abstr: *P. I., 25:* No. 1532, 1959.

27202. United Nations. Bureau of Social Affairs. Population Branch. (By Walter Hecht): The population of the Latin American republics. *Bull. Inst. int. Statist., Rio de J., 35:* 291-305, 1957. Abstr: *P. I., 25:* No. 1058, 1959.

27203. U. S. Bureau of the Census. (Prepared by Jacob S. Siegel): *The population of Hungary.* Int. Pop. Statist. Rep., Washington, 1958, Series P-90, No. 9, 186 pp. Abstr: *P. I., 25:* No. 1069, 1959.

27204. van den Brink, T.: Structure et évolution démographique dans les pays de Benelux. *Bull. Statist., Trimestriel, 2:* (5), 1958, 11 pp. Abstr: *P. I., 25:* No. 1301, 1959.

27205. Webb, J. N.: *Growth and change in Florida's population; 1950-1957.* Econ. Leaflets, Aug. 1958, entire issue.

IV. Economic Problems

27206. Abel-Smith, B.: Il costo di mantenimento delle persone anziane. *Longevità, 6:* 158-168, 1958.

27207. Ingegnieros, S.: Condizione socio-economica degli anziani milanesi. *Longevità, 6:* 104-106, 1958.

27208. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance. Division of Program Analysis: Assets and net worth of old-age and survivors insurance beneficiaries; highlights from preliminary data, 1957 survey. *Soc. Sec. Bull., 22:* 3-6, Jan. 1959.

See also Nos. 27217, 27400.

IV-B. Economic Problems: *Employment*

27209. Arkansas. Legislative Council. Research Department: *Employment problems of the aged and aging.* The Department, Little Rock, Res. Rep. No. 85, May 1958, 9 pp.

27210. Atelsek, F. J.: *Older worker employment problems; characteristics of older job-seekers; an analysis in terms of their unemployment histories.* Minn. Dept. of Unempl. Sec., Minneapolis, July 1958, 227 pp.

27211. Bancroft, G.: *The American labor force; its growth and changing composition.* John Wiley & Sons, New York, 1958, xiv, 256 pp. Abstr: *Science, 129:* 773, 1959.

27212. Briggs, M. C.: *400 jobs for people over 60.* Wayside Press, Mendota, Ill., 1958, 96 pp.

27213.

27214.

27215.

27216.

27217.

27218.

27219.

27220.

27221.

27222.

27223.

27224.

27225.

27226.

27227.

27228.

27213. Finsbury Health Center: *The Finsbury employment scheme for the elderly.* The Center, London, Jan. 1956, 6 pp.

27214. Forssman, S.: (The problem of occupation and employment of elderly persons.) *Soc.-med. Tidsk., 35:* 303-306, 1958.

27215. Griew, S.: Methodological problems in industrial ageing research. *Occup. Psychol., Lond., 33:* 36-45, 1959.

27216. Hubach, J. C.: (The aging pilot of commercial planes.) *Aeromed. acta, Soesterberg, 5:* 197-210, 1956-57.

27217. Indiana. State Commission on the Aging and Aged. Employment Security Division: *Employment and income in the later years.* The Division, Indianapolis, Feb. 1959, 57 pp.

27218. Murrell, K. F. H.: Major problems of industrial gerontology. *J. Geront., 14:* 216-221, 1959.

27219. Naville, P., La misura della vita lavorativa e l'impiego dei lavoratori anziani. *Longevità, 6:* 135-143, 1958.

27220. New York (State of). Commission Against Discrimination: *Corporations and employment agencies and the age discrimination law.* The Commission, New York, 1958, 17 pp.

27221. New York (State of). Commission Against Discrimination: *Survey . . . of placement of older workers by the New York State Employment Service.* The Commission, New York, Oct. 1958, 26 pp.

27222. Pennsylvania. Advisory Board on Problems of Older Workers: *Breaking through the age barrier.* Bur. of Empl. Sec., Dept of Labor & Indust. Harrisburg, May 1958, 30 pp.

27223. Pennsylvania. Bureau of Employment Security: *The Philadelphia older worker pilot project; November 1, 1957-June 30, 1958.* The Bureau, Harrisburg, 1958, 71 pp.

27224. Pennsylvania. Department of Labor and Industry. Advisory Board on Problems of Older Workers: *Conference summary. How to achieve a better balanced labor force by removing age barriers to employment.* The Board, Harrisburg, 1958, 16 pp.

27225. Pennsylvania. Lehigh County Community Council: *Design for the survey of the older worker.* The Council, Allentown, Oct. 1958, 19 pp.

27226. Rosenzweig, J.: Washington State population and labor force—past, present, and future. *Univ. Wash. bus. Rev., 17:* (9), 1-14, 1958. Abstr: *P. I., 25:* No. 1322, 1959.

27227. Steinkrauss, R. F.: *Resources of the aging unemployed; a study of residents of a highly urbanized neighborhood who were unemployed and between the ages of 40 and 65 as of January 15, 1957.* Neighborhood House Ass., Buffalo, N. Y., 1957, 129 pp.

27228. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance. Division of Program Analysis: Quarterly summary of earnings, employment and benefit data. *Bur. Old-Age & Surv. Insur., Div. Prog. Anal., 19:* (1), 1-24, 1959.

27229. Wisconsin Legislative Reference Library: *Brief resume of state legislation to prohibit discrimination in employment on the grounds of age.* The Library, Madison, 1958, 13 pp.

27230. Wolfbein, S. L.: La durata della vita lavorativa. *Longevità, 6:* 127-134, 1958.

27231. Yuker, H. E.: Symposium on geriatrics; the employment of older workers at Abilities Inc. *Sth. med. J., Birmingham, 51:* 1289-1292, 1958.

27232. Anonymous: How old is too old to work? *J. Amer. med. Ass., 169:* 153, 1959.

27233. Anonymous: "Second careers" considered. *Publ. Aid Ill., 26:* (3), 11, 1959.

See also Nos. 27167, 27394.

IV-C. Economic Problems: *Retirement and Pensions*

(See also Social Security)

27234. Breen, L. Z.: Criteria for retirement. (Editorial). *Geriatrics, 14:* 263-265, 1959.

27235. Cassell, W. F.: The retirement plan. *Canad. Nurse, 54:* 922-923, 1958.

27236. Chicago, Chamber of Commerce: *National conference on individual planning for retirement.* The Chamber, Chicago, Oct. 2, 1958.

27237. Hamilton, J. A., and D. C. Bronson: *Pensions.* McGraw-Hill Book Co., New York, 1958, 410 pp.

27238. Harmsen, H.: Sozialhygienische Erhebungen zur Frage der Pensionierung. *Vita Humana, 2:* 1-10, 1959.

27239. Huet, J.-A., and N. Gueritee: Préparation psychologique et physiologique à la retraite. *Rev. franç. Géront., 5:* 59-70, Feb. 1959.

27240. Jehring, J. J.: *The investment and administration of profit sharing trust funds.* Profit Sharing Res. Found., Evanston, Ill., 1957, 152 pp.

27241. New York. Community Council of Greater New York. Committee on Employment and Retirement Practices for Older Workers: *Retirement practices for older workers.* The Committee, New York, Oct. 1958, 34 pp.

27242. New York (State of). Civil Service Department: *Report on pre-retirement preparation seminars held at Kings Park State Hospital, May-June 1958.* The Department, New York, 1958, 20 pp.

27243. New York (State of). Department of Health. Bureau of Chronic Diseases and Geriatrics: *Day after tomorrow; a manual for those looking ahead to retirement.* Hlth. Educ. Serv., Albany, 1958, 28 pp.

27244. Niessen, A. M.: The railroad retirement annuities and survivor benefits. *Publ. Aid Ill., 26:* 6-11, Feb. 1959.

27245. Odlum, D. M.: L'hygiène mentale des vieux travaillers et les problèmes de la retraite. *Hyg. ment., Paris, 47:* 259-278, 1958.

27246. Philadelphia. Health and Welfare Council, Inc. Research Department: *A survey of educational programs for preparation for retirement in large companies located in Delaware, Montgomery and Philadelphia counties.* The Department, Philadelphia, June 1958, 16 pp.

27247. Ronayne, M. F.: How to prepare office workers for the day of compulsory retirement. *Off. Mgmt.*, —: 31, Nov. 1958.

27248. Schneider, B. S.: *Preparation for retirement; a selected and annotated bibliography.* School of Soc. Work & Div. of Geront., Univ. Mich., Ann Arbor, June 1957, 89 pp.

27249. Skolnik, A. M., and J. Zisman: Growth in employee-benefit plans, 1954-57. *Soc. Sec. Bull., 22:* 4-14, March 1959.

27250. U. S. Department of Labor. Bureau of Labor Statistics: *Digest of one hundred selected pension plans under collective bargaining, winter, 1957-58.* U. S. Govt. Print. Office, Washington, 1958, 71 pp.

27251. Various: *Retirement from the Armed Forces; prepared by a committee of retired Army, Navy and Air Force officers.* Mil. Ser. Publ. Co., Harrisburg, 2nd ed., 1958, 430 pp.

27252. Walker, R. W.: Pre-retirement planning; an appraisal of its extent, nature and value. *ILR Res., 4:* 10-14, Fall 1958.

27253. Anonymous: Great Britain; report for 1957 of the Ministry of Pensions and National Insurance. *Bull. Int. Soc. Sec. Ass.*, —: 434-439, Sept. 1958.

27254. Anonymous: *Preparation for retirement* World's Corner, Carson Pirie Scott Co., Chicago, Feb. 1959, 7 pp.

27255. Anonymous: Saving for retirement. *Med. J. Aust., 2:* 506-507, 1958.

V. Education
(adult)

27256. Chicago. Welfare Council of Metropolitan Chicago: *Education for senior citizens; report of committee on education and recreation for senior citizens, division on recreation and informal education.* The Council, Chicago, 1958, 11 pp.

27257. U. S. Office of Education: *Education on the aging; a selected annotated bibliography, by Betty Arnett Ward.* U. S. Govt. Print. Office, Washington, 1958, 145 pp.

27258. Vainstein, R.: Earmarked for the elderly — through the public library, our senior citizens are finding enrichment for their lives. *Sch. Life*, —: 1-2, Dec. 1958.

VI. Housing and Care

27259. Ashley, E. E.: *A brighter future for the later years. A review of federal housing aids for the elderly.* Housing & Home Finance Agency, Washington, 1958, 46 pp. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 313, 1959.

27260. Ashley, E. E.: *Housing for the elderly.* Housing & Home Finance Agency, Washington, 1958, 8 pp. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 314, 1959.

27261. Beyer, G. H.: *Housing; a factual analysis.* The Macmillan Co., New York, 1958. Abstr: *Maturity, 5:* (4), 20, 1958.

27262. California. Legislature. Senate. Interim Committee on Public Health: *Homes for the aged; first preliminary report.* State Print. Office, Sacramento, 1957, 98 pp.

27263. Chicago. National Association of Housing and Redevelopment Officials: Housing for the aged. *J. Housing, 15:* 298-348, 1958.

27264. Dallas Home for Jewish Aged: *Annual report; 1958.* The Home, Dallas, 1958, 14 pp. (Mimeogr.).

27265. Dayton (Ohio). Community Welfare Council of Dayton and Montgomery County: *Housing for the elderly; report of progress to the Committee on the Needs of Older Persons; March 11 to June 4, 1958.* The Council, Dayton, 1958, 7 pp.

27266. Degetto, L.: La casa di ricovero di padova. *Longevità, 6:* 99-101, 1958.

27267. Degetto, L.: Il pensionato piaggi. *Longevità, 6:* 102, 1958.

27268. Downs, A.: The market is ripe for retirement communities. *J. prop. Mgmt., 23:* 244-258, 1958.

27269. Droller, H.: Old age; re-housing old people. *Med. Pr.*, —: 162-168, 1959.

27270. Düttmann, W.: Homes for old people. *Med. World, Lond., 89:* 549-554, 1958.

27271. Great Britain. Ministry of Housing and Local Government: *Flatlets for old people.* H. M. Stationery Office, London, 1958, 20 pp.

27272. Grouse, G.: Running an old people's home. *Med. World, Lond., 89:* 464-465, 1958.

27273. Haeuser, C.: Architecture for the aged; factors to consider in designing facilities for elderly patients. *Hospitals, Chicago, 32:* 47, 1958.

27274. Illinois (University). Small Homes Council. (By H. Steinberg): *A check-list for retirement houses.* The Council, Urbana, 1958, 12 pp.

27275. Indiana State Board of Health. Commission on Aging: *Housing and living arrangements for the aged.* The Commission, Indianapolis, Sept. 1958, 45 pp.

27276. Leeds, M.: *Management and operation of homes for the aged; annotated bibliography.* Indiana Univ. Med. Center, Bloomington, 1958, 32 pp.

27277. Leeds, M. (Editor): *The county home in Indiana.* Indiana St. Comm. on Aging and Aged, Indianapolis, April 1959, 41 pp. (Mimeogr.).

27278. Milwaukee (Wis.). Housing Authority: *A report on housing accommodations of elderly persons in the City of Milwaukee.* The Authority, Milwaukee, Aug. 1958, 27 pp.

27279. New York. Community Council of Greater New York: *Homes for the aged; a study of developments during the past ten years.* The Council, New York, 1955, 31 pp.

27280. New York. Housing Authority: *Memo to architects, February 1952 (revised June 1958); designs of centers (within housing projects).* The Authority, New York, 1958, 3 pp.

27281. New York (State of). Department of Social Welfare: *Directory of homes and institutions for the aged and other adults in New York State.* The Department, Albany, 8th ed., 1958, 138 pp.

27282. New York (State of). Division of Housing: *Home care and housing needs of the aged; a report on a study, conducted by John G. Steinle and Associates.* The Division, New York, 1958, 56 pp.

27283. New York (State of). Division of Housing: *How to provide housing which the elderly can afford.* The Division, New York, Dec. 1958, 35 pp.

27284. New York (State of). Division of Housing. Bureau of Research and Statistics: *Housing problems and preferences of aged applicants ineligible for public housing in New York City.* The Bureau, New York, Dec. 1958, 66 pp.

27285. New York (State of). Division of Housing. Bureau of Research and Statistics: *Housing problems and preferences of aging persons on the site of Borgia Butler Houses, a state-aided low rent housing project in New York City.* The Bureau, New York, Dec. 1958, 47 pp.

27286. Roberts, G. W., and T. W. Hughes: A boarding-out scheme for the elderly. *Med. Offr., 100:* 53-55, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 433, 1959.

27287. Schenectady (N. Y.). Community Welfare Council: *A place to live; a study of the housing needs of older persons.* The Council, Schenectady, Sept. 1957, 24 pp.

27288. Washington (D. C.). Federal Housing Administration: *Remodeled buildings as housing for elderly tenants.* U. S. Govt. Print. Office, Washington, 1958.

27289. Washington (D. C.). Housing and Home Finance Agency: *Testimony of M. Carter McFarland, Acting Assistant Administrator, Housing and Home Finance Agency, before the Subcommittee on Safety and Compensation of the House Education and Labor Committee, Washington, D. C., April 30, 1958.* The Agency, Washington, 1958, 9 pp. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 455, 1959.

27290. Washington (D. C.). National Association of Home Builders: *Housing our senior citizens; summary report. A conference held May 28, 1958, sponsored by the National Housing Center and National Association of Home Builders.* The Association, Washington, Aug. 1958, 32 pp.

27291. White Plains (N. Y.). Westchester County Council of Social Agencies, Inc.: *Report of the committee on housing, July 1957. (Part III. Housing needs and problems of special groups. Includes housing for the aging and housing for the handicapped.)* The Council, White Plains, 1957, pp. 69-86.

27292. Anonymous: La Clairière maison de retraite de Gradignan. *Techn. hosp., Paris, 13:* 59-60, 1958.

See also Nos. 27037, 27040, 27061, 27120, 27377, 27382, 27391.

VII. Legal Problems

27293. Chiodi, V.: Problemi medico-legali dell'invecchiamento. *Gior. Geront., 4:* (Suppl.), 251-257, 1957. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 431, 1959.

See also No. 27079.

VIII. Medical Care

27294. Carp, L.: The forsaken elderly: problems in the provision of adequate medical care for the aged. *Amer. J. Econ. & Sociol., 18:* 15-24, Oct. 1958.

27295. Dixon, J. P.: Financing medical care for the aged. IV. The hospital's viewpoint. *Amer. J. publ. Hlth., 49:* 176-180, 1959.

27296. Farquhar, R. W.: Care of the aged; some socio-medical problems. *J. roy. Soc. Hlth., London, 78:* 824-833, 1958.

27297. Follmann, J. F., Jr.: Financing medical care for the aged. V. A voluntary health insurance viewpoint. *Amer. J. publ. Hlth., 49:* 180-185, 1959.

27298. Forbes, R. Y.: Compulsory removal of sick and aged persons from their homes. *Med. Offr., 99:* 375-379, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 425, 1959.

27299. Goldmann, F.: Financing medical care for the aged. I. The problem; the role of the federal government. *Amer. J. publ. Hlth., 49:* 161-168, 1959.

27300. Holle, H. A.: Financing medical care for the aged. III. Viewpoint of organized medicine. *Amer. J. publ. Hlth., 49:* 173-176, 1959.

27301. Odoroff, M. E., and L. M. Abbe: Use of general hospitals; variation with methods of payment. *Publ. Hlth. Rep., Wash., 74:* 316-324, 1959.

27302. Viswanathan, R.: Medico-social problems of old age. *J. Indian med. Ass., 31:* 208-214, 1958.

27303. Weaver, M. S.: Financing medical care for the aged. II. Public welfare viewpoint. *Amer. J. publ. Hlth., 49:* 168-173, 1959.

See also No. 27045.

IX. Social Problems

(includes social adjustment)

27304. Albany (N. Y.). Exchange Club: *Senior Citizens' guide to services in Albany.* The Club, Albany, 1958, 24 pp.

27305. American Association of University Women. Social and Economic Issues Committee: *Aging; social and economic issues.* The Committee, 1958, 13 papers.

27306. Amulree, B. W. S.: The social implications of an ageing population. *Med. Pr., 261:* 26-29, 1959. Abstr: *Geriatrics, 14:* 70A, 1959.

27307. Breen, L. Z.: Some problems of research in the field of aging. *Sociol. soc. Res., 41:* 412-416, 1957. Abstr: *P. A.,* 33: No. 925, 1959.

27308. Chicago. Prairie Avenue Courts Project: *Community services to older people; report submitted by Iva Aukes.* The Project, Chicago, Apr. 1956, 63 pp. (Mimeogr.).

27309. Chicago. Welfare Council of Metropolitan Chicago. Division of Family and Child Welfare: *Survey of field of services for older people.* The Division, Chicago, Sept. 1958, 24 pp.

27310. Cleveland (Ohio). Welfare Federation of Cleveland. Committee on Older Persons: *Summary of conference on planning to make later years better years.* The Committee, Cleveland, May 27, 1958, 23 pp.

27311. Connecticut. Commission on Services for Elderly Persons: *First biennial report to His Excellency, the Governor and to the General Assembly of the State of Connecticut.* The Commission, Hartford, Jan. 1959, 15 pp.

27312. Coppini, M. A.: La previdenza sociale per le persone anziane. *Riv. Infort. mal. Profes., 45:* 636-654, 1958.

27313. Dayton (Ohio). Community Welfare Council of Dayton and Montgomery County. Committee on Needs of Older Persons: *For the senior citizens in our community; opportunities and resources.* The Committee, Dayton, 1957, 13 pp.

27314. Enslin, J. M., and A. B. Chapman, Jr.: Survey report of the activity interests of the aging by the Danville Planning Committee on Resources for Older Persons. *Virginia med. Mon., 85:* 571-572, 1958.

27315. Fort Wayne (Ind.). Senior Citizens of Fort Wayne Area, Inc.: *Aids for aging; what to do; where to go; how to secure aid.* The Senior Citizens, Fort Wayne, 1959, 12 pp.

27316. Greater Hartford Community Council. Committee on Services for Older People: *Report of subcommittee on counseling and welfare.* The Committee, Hartford, Feb. 1956, 27 pp.

27317. Hass, R.: Finding useful roles for the aging. *J. soc. Ther., 3:* 141-146, 1957. Abstr: *P. A., 33:* No. 930, 1959.

27318. Havighurst, R. J.: Life styles of middle-aged people. *Vita Humana, 2:* 25-34, 1959.

27319. Hawkins, N. G.: *Medical sociology; theory, scope and methods.* Charles C. Thomas, Springfield, 1958, xvii, 290 pp.

27320. Illinois. Public Aid Commission: *The senior citizens of Bloomington-Normal, Illinois; a report on a survey of the problems and needs of persons 65 years of age and over for the Community Committee on Senior Citizens.* The Commission, Bloomington, Jan. 1959, 22 pp.

27321. Kentucky. Governor's Commission on Aging: *Fact book on aging.* The Commission, Frankfort, Oct. 1958, 76 pp.

27322. Lansing (Mich.). AFL-CIO Community Service Activities: *The Lansing story; an experiment in working with older citizens.* AFL-CIO Comm. Ser. Act., Lansing, Sept. 1958, 13 pp.

27323. Miami. Dade County Welfare Planning Council. Senior Citizens Division: *Nursing, convalescent and boarding homes; a report of the committee on nursing, convalescent and boarding homes.* The Division, Miami, Nov. 1957.

27324. Milwaukee (Wis.). National Council of Jewish Women: *A summary of "Darlings, We Are Growing Older!"; what does that mean to Milwaukee?* The Council, Milwaukee, Feb. 11, 1958, 23 pp.

27325. New York. Westchester County. Citizens Committee on Aging and Chronically Ill: *Report to the Honorable James D. Hopkins, County Executive, Westchester County.* The Committee, New York, Oct. 3, 1957, 10 pp.

27326. New York (State of). Interdepartmental Committee on Problems of the Aging: *New York State activities in the field of aging; 1955-1958.* The Committee, Albany, Sept. 1958, 44 pp.

27327. Oregon. State Council on Aging: *First biennial report to the governor, 1957-1959.* The Council, Eugene, Nov. 1958, 28 pp. (Mimeogr.).

27328. Palfi, M.: You have never been old; a social study in geriatrics. *Trans. N. Y. Acad. Sci., 21:* 435-441, 1959.

27329. Pennsylvania. Erie County Health Council: Report of the Committee in Chronic Diseases and Problems of the Aging, 1957. The Council, Erie, 1957, 29 pp.

27330. Pennsylvania. Lehigh County Community Council. Committee on Senior Citizens: *Report of the sub-committee on Cedarbrook.* The Committee, Allentown, Sept. 25, 1958, 6 pp.

27331. Peoria (Ill.). Community Chest and Council of Greater Peoria: *Organization chart: Senior Citizens' Executive Committee; Senior Citizens' Council. Description of functions. (Approved by Senior Citizens Committee).* Comm. Chest and Counc., Peoria, Aug. 20, 1957, 5 pp.

27332. Peoria (Ill.). Senior Citizens Council: *Report of committees.* The Council, Peoria, 1958, 15 pp.

27333. Reiter, P. J.: Le problème des gens agés au Danemark. *Hyg. ment., Paris, 47:* 279-289, 1958.

27334. Texas Society on Aging: *Report of legislative committee on aging.* The Society, Dallas, Jan. 13, 1959, 30 pp.

27335. Trenton (N. J.). Council of Social Agencies. Committee on Aging: *Greater Trenton and its senior citizens; a guide to community services.* The Committee, Trenton, 1957 (folder).

27336. Wallace, J. M.: The needs of elderly citizens. *Rehabilit. Rev., 25:* 19-26, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 307, 1959.

27337. Washington (D. C.). Episcopal Diocese. Department of Social Relations. Advisory Committee—Services for the Aging: *Community resources in the metropolitan Washington area with particular reference to the aging; selected notes from an institute on community resources.* The Committee, Washington, 1959, 16 pp.

27338. Washington (State of). Governor's Council on Aging: *Active living in added years; a handbook on community organization for senior adults. (Revised).* The Council, Olympia, Sept. 1958.

27339. Washington (State of). Governor's Council on Aging: *Report of governor's council on aging, November 1958.* The Council, Olympia, Nov. 1958, iii, 30 pp.

27340. Webber, I. L.: Aging in American society. *Sth. med. J., Birmingham, 51:* 1296-1302, 1958.

27341. Windsor, Ontario (Canada). Community Welfare Council. Committee on Services for Senior Citizens: *Memorandum on a total community program for the housing and assistance of aged people.* The Committee, Windsor, 1958, 10 pp.

27342.

27343.

27344.

27345.

27346.

27347.

27348.

27349.

27350.

27351.

27352.

27353.

27354.

27355.

27356.

27357.

27342. Worcester (Mass.). Community Council: *Report of the committee on aging; September 30, 1955 - September 30, 1956.* The Council, Worcester, 1956, 8 pp.

27343. World Health Organization. Regional Office for Europe: *The public health aspects of the aging of the population; report of an advisory group . . . convened, Oslo, 28 July - 2 August 1958.* The Office, Copenhagen, 1959, 31 pp.

27344. Zilli, A., G. Vallecorsi, and G. Bianucci: Aspetti medico-sociali della popolazione anziana della città di Firenze. I. Indagine clinico-statistica su 1000 ricoverati delle case di riposo. *Gior. Geront., 7:* 138-165, 1959.

27345. Anonymous: *Meeting the needs of the aged.* J. Jewish commun. Serv., 1958, 35 pp.

See also Nos. 26559, 26881, 27127.

X. Social Groups

27346. Cole, D. E.: Reddito spesa e risparmio delle famiglie anziane. *Longevità, 6:* 112-125, 1958.

27347. Florida. University. Institute of Gerontology. (Edited by Denton L. Scudder): *Organized religion and the older person; a report of the Eighth Annual Southern Conference on Gerontology held at the University of Florida April 10-11, 1958.* Univ. Fla. Press, Gainesville, 1958, 113 pp.

See also Nos. 27161, 27381, 27389.

XI. Social Security

27348. Cohen, W. J., and F. F. Fauri: The Social Security Amendments of 1958; another significant step forward. *Publ. Welfare, 17:* 2-8, 1959.

27349. Faulkner, E. J.: More social security benefits? *GP (Kansas City, Mo.), 18:* 163-166, 1958.

27350. Faulkner, E. J.: Statement of the Health Insurance Association of America on proposed Social Security Act amendments. *Neb. St. med. J., 43:* 540-544, 1958.

27351. King, G. S.: *The Ministry of Pensions and National Insurance.* Oxford Univ. Press, Inc., New York, 1958, 162 pp.

27352. McFarland, R. A., and F. R. Philbrook: Reform of social security legislation for miners in Belgium. *Industr. Labour, 20:* 306-311, 1958.

27353. Myers, R. J.: *Long-range cost estimates for old-age, survivors, and disability insurance under 1956 amendments.* Div. of Actuary, Soc. Sec. Adm., Washington, Aug. 1958, 51 pp.

27354. Oliaro, T., and C. Palenzona: Le système actuel des assurances sociales en Italie. *Concours méd., 81:* 77-78, 1959.

27355. Parker, T.: Social security for physicians? *J. S. med. Ass., 54:* 376-378, 1958.

27356. U. S. Advisory Council on Social Security Financing: *Financing old-age, survivors, and disability insurance; a report.* U. S. Govt. Print. Office, Washington, 1959, 30 pp.

27357. U. S. Department of Health, Education and Welfare. Social Security Administration: Social security in review; 1958 in review. *Soc. Sec. Bull., 22:* 1-3, March 1959.

27358. U. S. Department of Health, Education and Welfare. Social Security Administration. (By Robert J. Myers): Old-age, survivors, and disability insurance provisions; summary of legislation, 1935-58. *Soc. Sec. Bull., 22:* 15-20, Jan. 1959.

27359. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance. Advisory Council on Social Security Financing: Financing old-age, survivors, and disability insurance; report of the advisory council on social security financing. *Soc. Sec. Bull., 22:* 3-11, Feb. 1959.

27360. U. S. Department of Health, Education and Welfare. Social Security Administration. Division of Program Research. Office of the Commissioner. (Prepared by Sophie R. Dales): Proposed social security budget, 1959-60. *Soc. Sec. Bull., 22:* 15-17, March, 1959.

27361. U. S. Department of Health, Education and Welfare. Social Security Administration. Division of Program Research. Office of the Commissioner. (Prepared by Daniel S. Gerig): European multilateral social security treaties. *Soc. Sec. Bull., 22:* 12-14, Feb. 1959.

27362. U. S. Library of Congress. Legislative Reference Service. (By Helen Livingston and Frederick Arner): *Old-age, survivors, and disability insurance, public assistance, maternal and child welfare services, showing changes made in the Social Security Act by the 85th congress.* U. S. Govt. Print. Office, Washington, 1958, 49 pp.

27363. Anonymous: Cost of non-statutory social security schemes. *Int. Labour Rev., 78:* 388-403, 1958.

27364. Anonymous: Pensions insurance in Poland. *Industr. Labour, 20:* 176-281, 1958.

27365. Anonymous: Railroad workers in social security employment. *Mon. Rev., 19:* 3-8, Dec. 1958.

27366. Anonymous: Recent developments in the provision for old age in the United Kingdom. *Industr. Labour, 20:* 466-472. 1958.

27367. Anonymous: Reorganization of social insurance for self-employed handicraft workers in the German Democratic Republic. *Industr. Labour, 20:* 428-429, 1958.

27368. Anonymous: Social security agreements between the United Kingdom and other countries. *Industr. Labour, 20:* 275-276, 1958.

27369. Anonymous: Spain signs a number of International Social Security Conventions. *Industr. Labour, 20:* 425-427, 1958.

27370. Anonymous: Survey of occupational pension schemes in the United Kingdom. *Industr. Labour, 20:* 281-283, 1953.

XII. Social Services and Social Work

(Recreation and social aspects of rehabilitation. Medical rehabilitation under Geriatrics, Medical Care)

27371. Adelasio, S.: Esperienze nell'organizzazione di attività di tempo libero in una communità di anziani. *Longevità, 6:* 107-109, 1958.

27372. Austin (Tex.). Adult Services Council: *The shadow in our midst.* The Council, Austin, 1959, 6 pp. (Mimeogr.).

27373. Chicago. Abbott Laboratories: Meals on wheels; a new and progressive step in the care of the aged. *What's New, Chicago,* —: (203), 1-6, Dec. 1957.

27374. Colombo, U. M.: Responsabilità morale e professionale degli addetti ai servizi d'assistenza. *Longevità, 6:* (Suppl.), 3 pp., 1958.

27375. Davies, K.: Welfare of the aged in Norway. *Soc. Serv. Quart., Lond., 32:* 63-66, 1958. Abstr: *Soc. Sec. Bull., 22:* 14, Jan. 1959.

27376. Dayton (Ohio). Young Women's Christian Association: *Camping for older people; report of two camping periods; August 1957 and June 1958.* (Co-sponsored by Young Women's Christian Association and Community Welfare Council Committee on Recreation for Older People). The Association, Dayton, Sept. 1958, 22 pp.

27377. Eisler, L.: Geriatric social work. *J. Amer. geriat. Soc., 7:* 51-60, 1959.

27378. Emery, M.: Casework with the aging; today's frontier. *Soc. Casework, 39:* 455-459, 1958.

27379. Farber, A.: Noninstitutional services for the aged. *Soc. Work, 3:* 58-63, 1958. Abstr: *Soc. Sec. Bull., 22:* 25, Jan. 1959.

27380. Filer, R. N.: An activity program for old persons in a sheltered living community. *Geriatrics, 14:* 229-236, 1959.

27381. Jacobs, H. L.: *Churches and their senior citizens.* (Revised edition). Inst. of Geront., Iowa City, May, 1958, iii, 33 pp.

27382. Jacobs, J.: Housing the independent aged. *Archit. Forum* —: 86-91, Aug. 1958.

27383. Kaplan, J.: Community responsibilities in recreation programs for older adults. (Editorial). *Geriatrics, 13:* 547-548, 1958. Abstr: *Excerpta Medica, 2:* (Sect. 20), No. 435, 1959.

27384. Los Angeles (Calif.). Committee on Aging: *Combined report of the Los Angeles County Committee on Aging and the Senior Citizens Service Center, July 1, 1957 - June 30, 1958.* The Committee, Los Angeles, 1958, 12 pp.

27385. Los Angeles (County). Senior Citizens Service Center: *Handbook for forms for friendly visitors.* The Center, Los Angeles, 1958, 23 pp.

27386. Nepean-Gubbins, L.: The contribution of the home help organizer to the welfare of the aged. *J. roy. Soc. Hlth., London, 78:* 838-843, 1958.

27387. New York. Community Council of Greater New York: *Changing concepts in casework with older people; selected papers presented at an All-day institute, March 16, 1950.* The Council, New York, 1951, 23 pp.

27388. New York. Council of Jewish Federations and Welfare Funds. Aged Care Planning Committee: *Guidelines for institutional services for the aged in the small Jewish community.* The Committee, New York, 1959, iv, 22 pp.

27389. New York. National Council Protestant Episcopal Church. Division of Health and Welfare Services: *Aging; today's opportunities for the church.* The Division, New York, 1958, 47 pp.

27390. New York. National Jewish Welfare Board. Jewish Community Center Division: *Older adult programming in the Jewish Community Center. Approaches to standard-setting; proceedings of a consultation, December 16-17, 1957.* The Division, New York, 1958, 66 pp.

27391. Owen, R. E., T. Malone, and S. O'Connell: Campus living for the aging . . . at Kundig Center in Detroit. *Amer. J. Nurs., 58:* 1676-1678, 1958.

27392. Posner, W.: Casework with the aged; challenge or retreat. *Amer. J. Orthopsychiat., 28:* 328-333, 1958.

27393. Posner, W.: Socio-cultural factors in casework with adult children and aged parents. *J. Jewish commun. Serv., 35:* 193-201, 1958.

27394. Rudd, J. L., and S. N. Feingold: Medical and vocational cooperation in a geriatric workshop. *J. Amer. geriat. Soc., 7:* 349-359, 1959.

27395. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Homemaker services in the United States, 1958; a nationwide study, by William H. Stewart and others.* U. S. Govt. Print. Office, Washington, 1958, 92 pp.

27396. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Homemaker services in the United States, 1958; twelve statements describing different types of homemaker services.* U. S. Govt. Print. Office, Washington, 1958, 99 pp.

27397. Washington (State of). Governor's Council for Aging Population. Recreation and Leisure Time Activities Committee: *Directory of senior adult recreation and service organizations in the State of Washington.* The Committee, Olympia, 1956, 42 pp.

27398. Anonymous: Homemaker service. *Publ. Aid Ill., 26:* (3), 6-10, 1959.

See also Nos. 26571, 27091, 27256, 27286.

POPULAR ARTICLES

27399. Still, J. W.: *Old dogs—new tricks—new lives.* The Author, Doylestown, Pa., 1958, 3 pp.

27400. Still, J. W.: *Can we afford an aged population?* The Author, Doylestown, Pa., Jan. 1959, 4 pp.

27401. Various: Taking the old out of age; 1959. *The International Altrusan, 36:* 4-24, 1959.

27402. Woltereck, H.: *A new life in old age.* Reinhardt, London, 1958, 193 pp.

27403. Anonymous: Retire to a balmy clime? *Retirement plan. News, 4:* 1, Feb. 1959.